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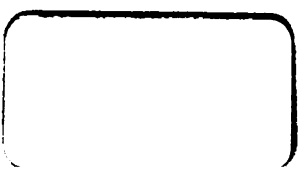

# REPORT

OF THE

# TESTS OF METALS

AND

# OTHER MATERIALS

FOR

# INDUSTRIAL PURPOSES,

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE FISCAL YEAR ENDED JUNE 30, 1899.

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# LETTER

FROM

# THE SECRETARY OF WAR,

TRANSMITTING

*A report of the commanding officer of Watertown Arsenal of "Tests of iron, steel, and other materials" made during the fiscal year ended June 30, 1899.*

---

WAR DEPARTMENT,
*Washington, January 10, 1900.*

SIR: I have the honor to transmit herewith, as required by law, copy of a report of the commanding officer of the Watertown Arsenal of "Tests of iron, steel, and other materials for industrial purposes," made at that arsenal during the fiscal year ended June 30, 1899.

Very respectfully,

ELIHU ROOT, *Secretary of War.*

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

---

WATERTOWN ARSENAL,
*Watertown, Mass., January 5, 1900.*

SIR: In compliance with the requirements of law I have the honor to forward herewith report of test of metals, etc., made at this arsenal during the fiscal year ending June 30, 1899.

The total number of specimens tested was 2,103, classified as follows:

| | |
|---|---|
| Gun specimens | 275 |
| For Ordnance Department | 735 |
| For other Government Departments | 4 |
| Investigative tests | 648 |
| Tests for private parties | 441 |
| Total | 2,103 |

The receipts and expenditures were as follows:

| | |
|---|---|
| Amount appropriated for testing machine and testing work | $10,000.00 |
| Received from private parties during the year | 1,074.61 |
| Total received | 11,074.61 |
| Amount expended for service and labor | 7,765.92 |
| Amount expended for light, power, tools, implements, and materials for test | 3,308.69 |
| Total expended | $11,074,61 |

The usual routine testing of ordnance material has been carried on by the testing department during the past fiscal year, comprising material for rapid-fire, field, siege, and seacoast guns, their mounts and carriages, and metal for small arms.

Tests have been made on steel for anchor bolts for carriages, gun-lever axles, proof stresses applied to piston rods, helical springs for mortar carriages, metal for soft-steel caps for armor-piercing shell, cast iron for gun and mortar carriages, bronze for gun mounts, cartridge brass, and other material representing current work of the Ordnance Department at this arsenal and other Government posts and stations where Government work is in progress.

Tests for private parties have been carried on as provided for by law.

In addition to these two main lines of testing, much work has been done of an investigative character on the properties of construction material, of value alike to the different branches of military and civil engineering.

There was a series of tests by hydrostatic pressure of sections over the powder chamber of .30-caliber rifle barrels.

The examination of slices of gun forgings for internal strains, introduced by cooling the metal from the surface of the bore, has been continued. These tests have been supplemented by the examination of metal from the tube of a 5-inch gun which burst under endurance trial. Internal strains thus introduced by quenching from the bore may be nearly or quite eliminated by annealing the metal, as herein shown by tests.

The concrete and mortar tests of last year have been continued and much additional data developed. The range of mixtures in both concrete and mortar has extended over such limits as would be comprised in the use of this class of material in construction. The growing importance attaching to concrete places tests of this class in an important relation to the building industries of the country. Concrete from a mixture so rich as 1 part cement to 2 parts of broken stone has been tested, and from that passing from different mixtures until the lean mixture of 1 part cement, 6 parts sand, and 12 parts broken stone was reached. Different ages of setting have been given, and diagrams accompany the details of the tests showing the gain in strength under such conditions. Mixtures have been prepared in which there has been a large excess or deficiency of mortar in proportion to the voids in the stone.

The experiments have included tests on mortar under conditions of retarded or so-called "second set," in which, by constant agitation, the cement has been kept from setting for a number of hours before being placed in the molds, where setting finally occurred. A very material loss in strength was shown to have taken place by this treatment.

When cement is set in large blocks there is a considerable rise in temperature in the mass. This was made the subject of inquiry, and the temperature of some cubes was observed over a number of hours until the maximum temperature had been reached. There was a very prompt rise of temperature observable soon after the cement was tamped into the mold, which rose slowly for about five hours, after which there was a rapid gain, reaching a maximum after nine and one-half to fifteen hours from the time of mixing.

The mixture containing the least water reached the maximum temperature earliest, and also attained the highest temperature, 200° F. in the case of a 12-inch cube.

The endurance tests of steel in the form of rotating shafts, transversely loaded, have been continued. The shafts have been run under a maximum fiber stress of 40,000 pounds per square inch. One shaft of the series has now reached 65,679,000 rotations and remains unruptured.

Interest centers on the endurance of steels under fiber stresses in the vicinity of 40,000 pounds per square inch, earlier tests having shown that many steels of high tensile properties were unable to endure repeated alternate stresses of this magnitude without rupture. With the advance in steel making the question presents itself as to how much the limit of endurance under repeated stresses has been raised, which must be answered by experiments covering the uncertain zone, or say between limits of 35,000 and 50,000 pounds per square inch.

Tests on the impact machine were inaugurated during the past year. Experiments were begun with the softer metals, lead, tin, zinc and copper, the principal series being upon lead.

The low elastic limit of lead and its great ductility makes this metal peculiarly well adapted for the early tests in an investigation on the effects of impact. The present tests show an increased resistance of flow of the metal with increased striking velocities of the falling ram. The cumulative effect of a number of short blows is greater than one blow from a height equal to the aggregate of the short blows, in this metal of low elastic limit. Thus, as an example, it was found that eighteen blows of 2 inches each produced the same effect as one blow of 56 inches on lead cylinders 1 inch diameter by 2 inches long with a 77-pound ram, and with blows of only one-half inch each this difference in effect was even greater. In these experiments the comparison is made between the total decrements in heights of the several specimens representing the total amount of work done on the metal. Obviously it is during the earlier stages of compression, while the ram has its highest velocity, that the greatest differences in resistance to flow are encountered, and the variations in resistance are therefore greater than the present comparisons can indicate.

An apparatus will be added to the impact machine in which the retardation of the falling ram will be recorded, thus enabling complete data to be obtained of the resistance encountered throughout a test.

Incidentally it was shown, in the present tests, that lead possesses the property of acquiring a temporary state of increased resistance against flow, from which there is relaxation after an interval of rest, and the total resistance is in a degree dependent upon the crystals present in the specimen. Lead cast in a slow-cooling mold, and acquiring a coarse crystalline structure, showing somewhat less resistance against impact than metal cast in a rapid-cooling mold, or after the metal had been drawn down into rods of smaller diameter in the manner employed in making lead pipe.

It was further shown that the greatest lateral flow took place in a direction parallel to the longitudinal axes of the crystals in lead, but in tin and zinc greatest flow occurred in a perpendicular direction; the blows of impact being normal to the length of the crystals.

In lead it was found that the relative rate of flow was changed after a specimen had been partially compressed and the compression renewed

after an interval of time. The disparity in the direction of flow was lessened, relatively greater flow now occurring in a direction perpendicular to the axes of the crystals, the elongation in lengthwise direction still leading, however.

Chemical analyses are recorded in the different grades of cast iron and steel, which are found in the body of the report.

A contract has been made for a smaller testing machine, of the Emery type, one of 200,000 pounds range, for tension and compression, to be delivered during the present fiscal year.

This machine will relieve the larger one of much of the routine testing, expediting work, and economizing time, heretofore necessarily taken in arranging the larger machine for all classes of work.

The testing department may now be considered nearly complete, with respect to its equipment. There is but $10,000 appropriated annually for material and labor of all kinds. This is the same amount as was appropriated the first year of its existence, while the work of the department has expanded fourfold. With an increased appropriation more skilled operators can be employed, and all the equipment kept in constant use. Instead of one operator we need four, and there is ample work for all.

It may be well to repeat here, for the benefit of the public at large, that private parties can have tests made upon their defraying the costs, which amount to $2.75 per hour; this is the law. The report of such tests is private property, and not made known to any but the parties ordering them.

My thanks are due to Mr. J. E. Howard, C. E., in charge of testing department, for his valuable work. Its accuracy and reliability has never been questioned.

Very respectfully, your obedient servant,

J. W. REILLY,
*Lieut. Col., Ordnance Department, U. S. A., Commanding.*

The CHIEF OF ORDNANCE, U. S. A.,
*Washington, D. C.*

# REPORT

OF THE

# TESTS OF METALS AND OTHER MATERIALS

FOR

## INDUSTRIAL PURPOSES,

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE FISCAL YEAR ENDED JUNE 30, 1899.

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# 6-POUNDER R. F. GUNS.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

## No. 6080.

Marks, $\frac{A\ 70\text{-}6\ T}{M_2}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000100 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000200 | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001750 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001800 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .001850 | .000050 | ..... | ..... | |
| 11,000 | 55,000 | .001900 | .000050 | ..... | ..... | Elastic limit. |
| 11,200 | 56,000 | .009000 | .007100 | ..... | ..... | |
| 11,400 | 57,000 | .010150 | .001150 | ..... | ..... | |
| 11,600 | 58,000 | .011000 | .000850 | ..... | ..... | |
| 11,800 | 59,000 | .012000 | .001000 | ..... | ..... | |
| 12,000 | 60,000 | .013000 | .001000 | ..... | ..... | |
| 18,310 | 91,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,550 |
| Elastic limit per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2950 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | ″.95 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ″.16, ″.43 |

## TUBE.

## No. 6115.

Marks, $\frac{A\ 114\text{-}6\ T}{M_1}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | 0. | ..... | |
| 10,000 | 50,000 | .001700 | .000250 | ..... | ..... | |
| 11,000 | 55,000 | .001950 | .000250 | ..... | ..... | |
| 11,200 | 56,000 | .002000 | .000050 | ..... | ..... | Elastic limit. |
| 11,400 | 57,000 | .006750 | .004750 | ..... | ..... | |
| 11,600 | 58,000 | .010000 | .003250 | ..... | ..... | |
| 11,800 | 59,000 | .011850 | .001850 | ..... | ..... | |
| 12,000 | 60,000 | .012850 | .001000 | ..... | ..... | |
| 12,200 | 61,000 | .013750 | .000900 | ..... | ..... | |
| 17,720 | 88,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,600 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .3000 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | do... | 59.8 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".35, ".25 |

## TUBE.

### No. 6116.

*Marks,* $\frac{A\ 116\text{-}6\ T}{M_1}$
*Diameter,* ".505.
*Sectional area,* .20 square inch.
*Gauged length,* 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000200 | ..... | ..... | |
| 11,200 | 56,000 | .001950 | .000800 | ..... | ..... | |
| 11,400 | 57,000 | .002000 | .000050 | ..... | ..... | Elastic limit. |
| 11,600 | 58,000 | .010000 | .008000 | ..... | ..... | |
| 11,800 | 59,000 | .011000 | .001000 | ..... | ..... | |
| 12,000 | 60,000 | .011850 | .000850 | ..... | ..... | |
| 12,200 | 61,000 | .012900 | .001050 | ..... | ..... | |
| 12,400 | 62,000 | .014000 | .001100 | ..... | ..... | |
| 18,020 | 90,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,100 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .2850 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | | 59.8 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".16, ".41* |

## JACKET.

### No. 6075.

Marks, $\frac{A\ 52\text{-}6\ J}{M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001200 | .000250 | 0. | ..... | |
| 9,200 | 46,000 | .001450 | .000250 | 0. | ..... | |
| 11,000 | 55,000 | .001900 | .000450 | ..... | ..... | |
| 11,200 | 56,000 | .001950 | .000050 | ..... | ..... | |
| 11,400 | 57,000 | .002000 | .000050 | ..... | ..... | |
| 11,600 | 58,000 | .002000 | 0. | ..... | ..... | |
| 11,800 | 59,000 | .002050 | .000050 | ..... | ..... | Elastic limit. |
| 12,000 | 60,000 | .002500 | .000450 | ..... | ..... | |
| 12,200 | 61,000 | .003650 | .001150 | ..... | ..... | |
| 12,400 | 62,000 | .008400 | .004750 | ..... | ..... | |
| 12,600 | 63,000 | .009000 | .000600 | ..... | ..... | |
| 12,800 | 64,000 | .010500 | .001500 | ..... | ..... | |
| 18,150 | 90,750 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,750 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".28* |

## JACKET.

## No. 6082.

Marks, $\frac{A\ 82\text{-}6\ J}{M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | 0. | ..... | |
| 9,200 | 46,000 | .001550 | .000250 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000100 | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001750 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001750 | 0. | ..... | ..... | |
| 10,800 | 54,000 | .001800 | .000050 | ..... | ..... | Elastic limit. |
| 11,000 | 55,000 | .002000 | .000200 | ..... | ..... | |
| 11,200 | 56,000 | .003150 | .001150 | ..... | ..... | |
| 11,400 | 57,000 | .003950 | .000800 | ..... | ..... | |
| 11,600 | 58,000 | .005000 | .001050 | ..... | ..... | |
| 11,800 | 59,000 | .006000 | .001000 | ..... | ..... | |
| 18,980 | 94,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of orginal section | pounds.. | 94,900 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".55 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".11, ".32* |

## JACKET.

## No. 6135.

Marks, $\frac{A-118-6\ J}{M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000050 | 0. | ..... | |
| 9,200 | 46,000 | .001500 | .000100 | 0. | ..... | |
| 10,000 | 50,000 | .001600 | .000100 | ..... | ..... | |
| 10,200 | 51,000 | .001650 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001700 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001750 | .000050 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .001950 | .000200 | ..... | ..... | |
| 11,000 | 55,000 | .002300 | .000350 | ..... | ..... | |
| 11,200 | 56,000 | .003400 | .001100 | ..... | ..... | |
| 11,400 | 57,000 | .005000 | .001600 | ..... | ..... | |
| 11,600 | 58,000 | .007750 | .002750 | ..... | ..... | |
| 18,240 | 91,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,200 |
| Elastic limit per square inch of original section | do... | 58,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".19, ".26 |

## JACKET.

## No. 6136.

Marks, $\frac{A}{B}$ 121-6 J
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000050 | 0. | ..... | |
| 9,200 | 46,000 | .001500 | .000100 | 0. | ..... | |
| 9,800 | 49,000 | .001600 | .000100 | ..... | ..... | Elastic limit. |
| 10,000 | 50,000 | .001800 | .000200 | ..... | ..... | |
| 10,200 | 51,000 | .002350 | .000550 | ..... | ..... | |
| 10,400 | 52,000 | .002900 | .000550 | ..... | ..... | |
| 10,600 | 53,000 | .003600 | .000700 | ..... | ..... | |
| 10,800 | 54,000 | .004650 | .001050 | ..... | ..... | |
| 11,000 | 55,000 | .005500 | .000850 | ..... | ..... | |
| 19,120 | 95,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,600 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .1550 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ".55 from neck |
| Character of broken surface | | fine granular, flaky spot at the circumference |
| Elongation of inch sections | | ".21*, ".10 |

*TABULATION OF TENSION SPECIMENS FROM 6-POUNDER R. F. GUNS.*
*(STEMS 2" LONG, ".505 DIAMETER.)*

| No. of test. | Position in gun. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | *Pounds.* | *Pounds.* | *Per ct.* | *Per ct.* | | |
| 6060 | Tube .... | 55,000 | 91,550 | 29.5 | 57.2 | Fine silky, cup shaped..... | Muzzle end. |
| 6115 | ...do ..... | 56,000 | 88,600 | 30.0 | 59.8 | .....do..... | Do. |
| 6116 | ...do ..... | 57,000 | 90,100 | 28.5 | 59.8 | .....do..... | Do. |
| 6075 | Jacket ... | 59,000 | 90,750 | 21.5 | 46.2 | Silky..... | Do. |
| 6082 | ...do ..... | 54,000 | 94,900 | 21.5 | 46.2 | .....do..... | Do. |
| 6135 | ...do ..... | 58,000 | 91,200 | 22.5 | 49.1 | .....do..... | Do. |
| 6136 | ...do ..... | 49,000 | 95,600 | 15.5 | 20.5 | Fine granular, flaky spot at the circumference. | Breech end. |

# 3-INCH R. F. GUNS.

## SPECIMENS FROM TUBES, JACKETS, AND HOOPS.

## TUBE.

## No. 6022.

Marks, A–30–$M_2$.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000300 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000050 | 0. | ..... | |
| 10,000 | 50,000 | .001850 | .000050 | ..... | ..... | |
| 10,200 | 51,000 | .001900 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001950 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .002000 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .002050 | .000050 | ..... | ..... | |
| 11,000 | 55,000 | .002050 | 0. | ..... | ..... | |
| 11,200 | 56,000 | .002100 | .000050 | ..... | ..... | |
| 11,400 | 57,000 | .002200 | .000100 | ..... | ..... | |
| 11,600 | 58,000 | .002300 | .000100 | ..... | ..... | Elastic limit. |
| 11,800 | 59,000 | .002650 | .000350 | ..... | ..... | |
| 12,000 | 60,000 | .003000 | .000350 | ..... | ..... | |
| 12,200 | 61,000 | .003900 | .000900 | ..... | ..... | |
| 12,400 | 62,000 | .010150 | .001250 | ..... | ..... | |
| 12,600 | 63,000 | .011500 | .001350 | ..... | ..... | |
| 17,980 | 89,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,800 |
| Elastic limit per square inch of original section | do... | 58,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002300 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.8 |
| Position of rupture | | "8 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".10, ".30* |

## TUBE.

## No. 6023.

Marks, A–31–$M_2$.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001300 | .000300 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000150 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000050 | 0. | ..... | |
| 10,000 | 50,000 | .001900 | .000400 | ..... | ..... | |
| 10,200 | 51,000 | .001950 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .002000 | .000050 | ..... | ..... | Elastic limit. |
| 10,600 | 53,000 | .002350 | .000350 | ..... | ..... | |
| 10,800 | 54,000 | .002950 | .000600 | ..... | ..... | |
| 11,000 | 55,000 | .007000 | .004050 | ..... | ..... | |
| 11,200 | 56,000 | .010000 | .003000 | ..... | ..... | |
| 11,400 | 57,000 | .011000 | .001000 | ..... | ..... | |
| 17,640 | 88,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,200 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch... | .2500 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".26*, ".24* |

## TUBE.

## No. 6074.

**Marks,** $\frac{A\ 50\text{-}3\ T}{B_1}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000100 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000100 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000250 | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001750 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001800 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .001850 | .000050 | ..... | ..... | |
| 11,000 | 55,000 | .001900 | .000050 | ..... | ..... | |
| 11,200 | 56,000 | .001950 | .000050 | ..... | ..... | |
| 11,400 | 57,000 | .002000 | .000050 | ..... | ..... | Elastic limit. |
| 11,600 | 58,000 | .002400 | .000400 | ..... | ..... | |
| 11,800 | 59,000 | .004250 | .001850 | ..... | ..... | |
| 12,000 | 60,000 | .009500 | .005250 | ..... | ..... | |
| 12,200 | 61,000 | .010350 | .000850 | ..... | ..... | |
| 12,400 | 62,000 | .011500 | .001150 | ..... | ..... | |
| 17,660 | 88,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,300 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".96 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".10, ".32* |

## TUBE.

## No. 6081.

Marks, $\frac{A\ 78\text{-}3\ T}{M_1}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000100 | 0. | ..... | |
| 10,000 | 50,000 | .001750 | .000250 | ..... | ..... | |
| 10,200 | 51,000 | .001800 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001850 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001900 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .001950 | .000050 | ..... | ..... | |
| 11,000 | 55,000 | .002000 | .000050 | ..... | ..... | |
| 11,200 | 56,000 | .002000 | 0. | ..... | ..... | Elastic limit. |
| 11,400 | 57,000 | .002600 | .000600 | ..... | ..... | |
| 11,600 | 58,000 | .003350 | .000750 | ..... | ..... | |
| 11,800 | 59,000 | .004500 | .001150 | ..... | ..... | |
| 12,000 | 60,000 | .006750 | .002250 | ..... | ..... | |
| 12,200 | 61,000 | .007750 | .001000 | ..... | ..... | |
| 19,320 | 96,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 96,600 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .1850 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 84.0 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | granular 60 per cent, silky flaky 40 per cent |
| Elongation of inch sections | | ".24, ".13 |

## TUBE.

## No. 6114.

Marks, $\frac{A\ 112\text{-}8\ T}{B_1}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000100 | ..... | ..... | |
| 10,000 | 50,000 | .001850 | .000350 | ..... | ..... | |
| 10,200 | 51,000 | .001900 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001900 | 0. | ..... | ..... | |
| 10,600 | 53,000 | .001950 | .000050 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .002250 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .003400 | .001150 | ..... | ..... | |
| 11,200 | 56,000 | .006900 | .003500 | ..... | ..... | |
| 11,400 | 57,000 | .008000 | .001100 | ..... | ..... | |
| 11,600 | 58,000 | .008750 | .000750 | ..... | ..... | |
| 17,640 | 88,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,200 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .0800 |
| Elongation per inch under strain at elastic limit | do... | .001950 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | do... | 9.5 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | fine granular, radiating from a flaky streak at the circumference |
| Elongation of inch sections | | ".08, ".08* |

## TUBE.

## No. 6137.

Marks, $\frac{A\ 128\text{-}3\ T}{B_1}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001250 | .000100 | ..... | ..... | |
| 8,400 | 42,000 | .001350 | .000100 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000300 | ..... | ..... | |
| 10,200 | 51,000 | .001650 | 0. | ..... | ..... | |
| 10,400 | 52,000 | .001700 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001750 | .000050 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .005000 | .003250 | ..... | ..... | |
| 11,000 | 55,000 | .010000 | .005000 | ..... | ..... | |
| 11,200 | 56,000 | .011000 | .001000 | ..... | ..... | |
| 11,400 | 57,000 | .011650 | .000650 | ..... | ..... | |
| 11,600 | 58,000 | .013000 | .001350 | ..... | ..... | |
| 17,180 | 85,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 85,900 |
| Elastic limit per square inch of original section | do.... | 53,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do.... | .001750 |
| Reduction in diameter at point of rupture | do.... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".12, ".35* |

## TUBE.

## No. 6138.

Marks, $\frac{A\ 132\text{-}3'\ T}{B_2}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001200 | .000100 | ..... | ..... | |
| 8,400 | 42,000 | .001300 | .000100 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | .000300 | ..... | ..... | |
| 10,200 | 51,000 | .001650 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001650 | 0. | ..... | ..... | |
| 10,600 | 53,000 | .001700 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .001750 | .000050 | ..... | ..... | |
| 11,000 | 55,000 | .001850 | .000100 | ..... | ..... | Elastic limit. |
| 11,200 | 56,000 | .005500 | .003650 | ..... | ..... | |
| 11,400 | 57,000 | .008250 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .011000 | .002750 | ..... | ..... | |
| 11,800 | 57,000 | .012550 | .001550 | ..... | ..... | |
| 12,000 | 60,000 | .014250 | .001700 | ..... | ..... | |
| 17,260 | 86,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 86,300 |
| Elastic limit per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2350 |
| Elongation per inch under strain at elastic limit | do... | .001850 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".10, ".37* |

## TUBE.

## No. 6149.

Marks, $\frac{A\ 142\text{-}3\ T}{B_2}$
Diameter, ".500.
Sectional area, .196 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 196 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 980 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,960 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,920 | 20,000 | .000600 | .000400 | ..... | ..... | |
| 5,880 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 6,860 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 7,840 | 40,000 | .001300 | .000150 | ..... | ..... | |
| 8,232 | 42,000 | .001450 | .000150 | 0. | ..... | |
| 8,428 | 43,000 | .001450 | 0. | ..... | ..... | |
| 8,624 | 44,000 | .001500 | .000050 | ..... | ..... | |
| 8,820 | 45,000 | .001550 | .000050 | ..... | ..... | |
| 9,016 | 46,000 | .001600 | .000050 | ..... | ..... | |
| 9,212 | 47,000 | .001600 | 0. | ..... | ..... | |
| 9,408 | 48,000 | .001650 | .000050 | ..... | ..... | |
| 9,604 | 49,000 | .001650 | 0. | ..... | ..... | |
| 9,800 | 50,000 | .001700 | .000050 | ..... | ..... | |
| 9,996 | 51,000 | .001700 | 0. | ..... | ..... | |
| 10,192 | 52,000 | .001750 | .000050 | ..... | ..... | |
| 10,388 | 53,000 | .001800 | .000050 | ..... | ..... | |
| 10,584 | 54,000 | .001800 | 0. | ..... | ..... | |
| 10,780 | 55,000 | .001900 | .000100 | ..... | ..... | |
| 10,976 | 56,000 | .002000 | .000100 | ..... | ..... | Elastic limit. |
| 11,172 | 57,000 | .002300 | .000300 | ..... | ..... | |
| 11,368 | 58,000 | .003600 | .001300 | ..... | ..... | |
| 11,564 | 59,000 | .006000 | .002400 | ..... | ..... | |
| 11,760 | 60,000 | .009000 | .003000 | ..... | ..... | |
| 11,956 | 61,000 | .010250 | .001250 | ..... | ..... | |
| 18,320 | 93,470 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 93,470 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 42.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | $''.20^{a}, ''.22^{b}$ |

## TUBE.

## No. 6179.

Marks, $\frac{A-161-3\ T}{B_2}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000400 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | 0. | ..... | |
| 8,600 | 43,000 | .001500 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001550 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001600 | .000050 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .015500 | .013900 | ..... | ..... | |
| 9,400 | 47,000 | .016750 | .001250 | ..... | ..... | |
| 9,600 | 48,000 | .018000 | .001250 | ..... | ..... | |
| 9,800 | 49,000 | .019050 | .001050 | ..... | ..... | |
| 10,000 | 50,000 | .020600 | .001550 | ..... | ..... | |
| 15,510 | 77,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,550 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2600 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky, serrated |
| Elongation of inch sections | | ".16, ".36* |

## TUBE.

## No. 6180.

Marks, $\frac{A\text{-}164\text{-}3\ T}{B_2}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000300 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000050 | 0. | ..... | |
| 8,600 | 43,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 8,800 | 44,000 | .012250 | .010700 | ..... | ..... | |
| 9,000 | 45,000 | .013700 | .001450 | ..... | ..... | |
| 9,200 | 46,000 | .015100 | .001400 | ..... | ..... | |
| 9,400 | 47,000 | .016600 | .001500 | ..... | ..... | |
| 9,600 | 48,000 | .017600 | .001000 | ..... | ..... | |
| 15,620 | 78,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,100 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .2650 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".04 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | .18, ".35* |

## TUBE.

### No. 6355.

**Marks,** $\frac{A-78-3\ T}{B_4}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | 0. | ..... | |
| 10,000 | 50,000 | .001850 | .000400 | ..... | ..... | |
| 10,200 | 51,000 | .001900 | .000050 | ..... | ..... | Elastic limit. |
| 10,400 | 52,000 | .002300 | .000400 | ..... | ..... | |
| 10,600 | 53,000 | .004300 | .002000 | ..... | ..... | |
| 10,800 | 54,000 | .005350 | .001050 | ..... | ..... | |
| 11,000 | 55,000 | .006000 | .000650 | ..... | ..... | |
| 11,200 | 56,000 | .007250 | .001250 | ..... | ..... | |
| 18,320 | 91,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,600 |
| Elastic limit per square inch of original section | do... | 51,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".12,".31* |

## TUBE.

## No. 6356.

Marks, $\frac{A\ 215\text{-}3\ T}{B\ J_2}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000300 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000250 | ..... | ..... | |
| 10,200 | 51,000 | .001750 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001800 | .000050 | ..... | ..... | Elastic limit. |
| 10,600 | 53,000 | .005600 | .003800 | ..... | ..... | |
| 10,800 | 54,000 | .007150 | .001550 | ..... | ..... | |
| 11,000 | 55,000 | .008750 | .001600 | ..... | ..... | |
| 11,200 | 56,000 | .011500 | .002750 | ..... | ..... | |
| 11,400 | 57,000 | .013250 | .001750 | ..... | ..... | |
| 17,320 | 86,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 86,600 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".12, ".34* |

## JACKET.

## No. 6073.

Marks, $\frac{A}{M}\ ^{47\text{-}3\ J}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | 0. | ..... | |
| 9,200 | 46,000 | .001500 | .000200 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000200 | ..... | ..... | |
| 10,200 | 51,000 | .001750 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001800 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001900 | .000100 | ..... | ..... | |
| 10,800 | 54,000 | .001950 | .000050 | ..... | ..... | |
| 11,000 | 55,000 | .002000 | .000050 | ..... | ..... | |
| 11,200 | 56,000 | .002050 | .000050 | ..... | ..... | Elastic limit. |
| 11,400 | 57,000 | .002200 | .000150 | ..... | ..... | |
| 11,600 | 58,000 | .006500 | .004300 | ..... | ..... | |
| 11,800 | 59,000 | .007500 | .001000 | ..... | ..... | |
| 12,000 | 60,000 | .008950 | .001450 | ..... | ..... | |
| 12,200 | 61,000 | .010000 | .001050 | ..... | ..... | |
| 18,040 | 90,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,200 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .2050 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 87.1 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".28", ".13 |

## JACKET.

## No. 6117.

Marks, $\frac{A\ 90-3\ J}{B\ T}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | 0. | ..... | |
| 9,200 | 46,000 | .001600 | .000200 | 0. | ..... | |
| 10,800 | 54,000 | .002000 | .000400 | ..... | ..... | Elastic limit. |
| 11,000 | 55,000 | .011000 | .009000 | ..... | ..... | |
| 11,200 | 56,000 | .011900 | .000900 | ..... | ..... | |
| 11,400 | 57,000 | .012450 | .000550 | ..... | ..... | |
| 11,600 | 58,000 | .013500 | .001050 | ..... | ..... | |
| 11,800 | 59,000 | .015000 | .001500 | ..... | ..... | |
| 16,770 | 83,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 83,850 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | granular, radiating from a silky flaky spot at circumference |
| Elongation of inch sections | | ".30*, ".16 |

## JACKET.

## No. 6162.

**Marks,** $\frac{A-137-3J}{M_2}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000050 | .000050 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000450 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | 0. | ..... | |
| 9,200 | 46,000 | .001550 | .000150 | 0. | ..... | |
| 9,400 | 47,000 | .001600 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001650 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001700 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | 0. | ..... | ..... | |
| 10,200 | 51,000 | .001750 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001800 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001850 | .000050 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .004000 | .002150 | ..... | ..... | |
| 11,000 | 55,000 | .007500 | .003500 | ..... | ..... | |
| 11,200 | 56,000 | .009500 | .002000 | ..... | ..... | |
| 11,400 | 57,000 | .010700 | .001200 | ..... | ..... | |
| 11,600 | 58,000 | .011750 | .001050 | ..... | ..... | |
| 17,310 | 86,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 86,550 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .2600 |
| Elongation per inch under strain at elastic limit | do... | .001850 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".17,".35* |

## JACKET.

## No. 6163.

Marks, $\frac{A\ 151\text{-}3\ J}{M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | 0. | ..... | |
| 9,200 | 46,000 | .001550 | .000150 | 0. | ..... | |
| 9,400 | 47,000 | .001550 | 0. | ..... | ..... | |
| 9,600 | 48,000 | .001600 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001650 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001650 | 0. | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001750 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001800 | .000050 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .002000 | .000200 | ..... | ..... | |
| 11,000 | 55,000 | .003500 | .001500 | ..... | ..... | |
| 11,200 | 56,000 | .005750 | .002250 | ..... | ..... | |
| 11,400 | 57,000 | .007050 | .001300 | ..... | ..... | |
| 11,600 | 58,000 | .008250 | .001200 | ..... | ..... | |
| 18,300 | 91,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,500 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .2450 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".30", ".19 |

## Hoop.

## No. 6072.

**Marks,** $\frac{A\ 54\text{-}3\ H}{B_1}$
**Diameter,** ″.505.
**Sectional area,** .20 square inch.
**Gauged length,** 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | ..... | ..... | |
| 9,000 | 45,000 | .001500 | .000150 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000150 | 0. | ..... | |
| 11,000 | 55,000 | .001900 | .000250 | ..... | ..... | Elastic limit. |
| 11,200 | 56,000 | .002650 | .000750 | ..... | ..... | |
| 11,400 | 57,000 | .012550 | .009900 | ..... | ..... | |
| 11,600 | 58,000 | .013800 | .001250 | ..... | ..... | |
| 12,000 | 60,000 | .015950 | .002150 | ..... | ..... | |
| 17,020 | 85,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 85,100 |
| Elastic limit, per square inch of original section | do.. | 55,000 |
| Elongation per inch after rupture | inch.. | .2350 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | ″.6 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.36*, ″.11 |

*TABULATION OF TENSION SPECIMENS FROM 3-INCH R. F. GUNS.*
*(STEMS 2" LONG, .505 DIAMETER.)*

| No. of test. | Position in gun. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | *Pounds.* | *Pounds.* | *Pr. ct.* | *Pr. ct.* | | |
| 6022 | Tube | 58,000 | 89,800 | 20.0 | 43.3 | Silky | Muzzle end. |
| 6023 | do | 52,000 | 88,200 | 25.0 | 49.1 | do | Do. |
| 6074 | do | 57,000 | 88,300 | 21.0 | 46.2 | do | Breech end. |
| 6081 | do | 56,000 | 96,600 | 18.5 | 34.0 | Granular, 60 per cent; silky flaky, 40 per cent. | Muzzle end. |
| 6114 | do | 53,000 | 88,200 | 8.0 | 9.5 | Fine granular, radiating from a flaky spot at circumference. | Breech end. |
| 6137 | do | 53,000 | 85,900 | 24.0 | 49.1 | Fine silky | Do. |
| 6138 | do | 55,000 | 86,300 | 23.5 | 46.2 | do | Do. |
| 6149 | do | 56,000 | 93,470 | 21.5 | 42.1 | Silky | Do. |
| 6179 | do | 45,000 | 77,550 | 26.0 | 46.2 | Silky, serrated | Do. |
| 6180 | do | 43,000 | 78,100 | 26.5 | 46.2 | Silky, oblique | Do. |
| 6355 | do | 51,000 | 91,600 | 21.5 | 43.3 | Silky | Do. |
| 6356 | do | 52,000 | 86,600 | 23.0 | 46.2 | do | Do. |
| 6073 | Jacket | 56,000 | 90,200 | 20.5 | 37.1 | do | Muzzle end. |
| 6117 | do | 54,000 | 83,850 | 23.0 | 30.7 | Granular, radiating from a silky flaky spot at circumference. | Breech end. |
| 6162 | do | 53,000 | 86,550 | 26.0 | 46.2 | Silky | Muzzle end. |
| 6163 | do | 53,000 | 91,500 | 24.5 | 46.2 | do | Do. |
| 6072 | Hoop | 55,000 | 85,100 | 23.5 | 51.9 | do | Breech end. |

# 3.2-INCH B. L. STEEL FIELD GUNS.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

No. 6014.

Marks, $\frac{11261\ B_4\ F_2}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000100 | 0. | ..... | |
| 9,200 | 46,000 | .001550 | .000100 | ..... | ..... | |
| 9,400 | 47,000 | .001600 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001600 | 0. | ..... | ..... | |
| 9,800 | 49,000 | .001650 | .000050 | ..... | ..... | Elastic limit. |
| 10,000 | 50,000 | .002150 | .000500 | ..... | ..... | |
| 10,200 | 51,000 | .003500 | .001350 | ..... | ..... | |
| 10,400 | 52,000 | .006500 | .003000 | ..... | ..... | |
| 10,600 | 53,000 | .007650 | .001150 | ..... | ..... | |
| 10,800 | 54,000 | .008400 | .000750 | ..... | ..... | |
| 18,180 | 90,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 90,900 |
| Elastic limit, per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent. of original section | | 43.8 |
| Position of rupture | | ″.9 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ″.31*, ″.14 |

## TUBE.

## No. 6095.

Marks, $\frac{11251\ B_3\ F_2}{B\ T_6 M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | 0. | ..... | |
| 4,000 | 20,000 | .000550 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000100 | 0. | ..... | |
| 8,600 | 43,000 | .001450 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001450 | 0. | ..... | ..... | |
| 9,000 | 45,000 | .001500 | .000050 | ..... | ..... | |
| 9,200 | 46,000 | .001500 | 0. | ..... | ..... | |
| 9,400 | 47,000 | .001550 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001600 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001650 | .000050 | ..... | ..... | Elastic limit. |
| 10,000 | 50,000 | .001800 | .000150 | ..... | ..... | |
| 10,200 | 51,000 | .002800 | .001000 | ..... | ..... | |
| 10,400 | 52,000 | .004000 | .001200 | ..... | ..... | |
| 10,600 | 53,000 | .006000 | .001000 | ..... | ..... | |
| 10,800 | 54,000 | .005900 | .000900 | ..... | ..... | |
| 19,020 | 95,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,100 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | granular, radiating from a silky spot in the circumference |
| Elongation of inch sections | | ".28*, ".15 |

## TUBE.

## No. 6127.

Marks, $\frac{11261}{M\ T_4\ M}\ B_2\ F_1$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | ..... | ..... | |
| 2,000 | 10,000 | .000300 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000150 | ..... | ..... | |
| 8,600 | 43,000 | .001450 | 0. | ..... | ..... | |
| 8,800 | 44,000 | .001500 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001550 | .000050 | ..... | ..... | |
| 9,200 | 46,000 | .001550 | 0. | ..... | ..... | |
| 9,400 | 47,000 | .001600 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001650 | .000050 | ..... | ..... | Elastic limit. |
| 9,800 | 49,000 | .003050 | .001400 | ..... | ..... | |
| 10,000 | 50,000 | .003600 | .000550 | ..... | ..... | |
| 10,200 | 51,000 | .004650 | .001050 | ..... | ..... | |
| 10,400 | 52,000 | .005500 | .000850 | ..... | ..... | |
| 10,600 | 53,000 | .006450 | .000950 | ..... | ..... | |
| 18,200 | 91,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,000 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2200 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".32*, ".12 |

## JACKET.

## No. 6034.

Marks, $\frac{11265\ B_7\ F_2}{M\ T_2\ M}$
Diameter, ".504.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | 0. | ..... | |
| 9,200 | 46,000 | .001550 | .000150 | 0. | ..... | |
| 9,400 | 47,000 | .001600 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001650 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001700 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001750 | .000050 | ..... | ..... | |
| 10,200 | 51,000 | .001850 | .000100 | ..... | ..... | |
| 10,400 | 52,000 | .001950 | .000100 | ..... | ..... | |
| 10,600 | 53,000 | .002050 | .000100 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .002450 | .000400 | ..... | ..... | |
| 11,000 | 55,000 | .003200 | .000750 | ..... | ..... | |
| 11,200 | 56,000 | .004400 | .001200 | ..... | ..... | |
| 11,400 | 57,000 | .005500 | .001100 | ..... | ..... | |
| 11,600 | 58,000 | .006750 | .001250 | ..... | ..... | |
| 18,880 | 94,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,400 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .1550 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | Granular |
| Elongation of inch sections | | ".16[6], ".15 |

## JACKET.

## No. 6067.

**Marks,** $\frac{11265\ B_4\ F_2}{B\ T_2\ M}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | 0. | ..... | |
| 9,200 | 46,000 | .001550 | .000200 | 0. | ..... | |
| 9,400 | 47,000 | .001550 | 0. | ..... | ..... | |
| 9,600 | 48,000 | .001600 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001700 | .000100 | ..... | ..... | |
| 10,000 | 50,000 | .001750 | .000050 | ..... | ..... | Elastic limit. |
| 10,200 | 51,000 | .002450 | .000700 | ..... | ..... | |
| 10,400 | 52,000 | .004500 | .002050 | ..... | ..... | |
| 10,600 | 53,000 | .005850 | .001350 | ..... | ..... | |
| 10,800 | 54,000 | .006500 | .000650 | ..... | ..... | |
| 11,000 | 55,000 | .007250 | .007050 | ..... | ..... | |
| 18,880 | 94,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,400 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky, trace of granulation at the circumference |
| Elongation of inch sections | | ".27*, ".18 |

## JACKET.

## No. 6077.

Marks, $\frac{11408\ B_2\ F_2}{M\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000400 | ..... | ..... | |
| 9,200 | 46,000 | .001700 | .000250 | 0. | ..... | |
| 10,000 | 50,000 | .001950 | .000250 | ..... | ..... | |
| 10,200 | 51,000 | .002000 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .002050 | .000050 | ..... | ..... | Elastic limit. |
| 10,600 | 53,000 | .002350 | .000300 | ..... | ..... | |
| 10,800 | 54,000 | .002650 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .003000 | .000350 | ..... | ..... | |
| 11,200 | 56,000 | .003600 | .000600 | ..... | ..... | |
| 11,400 | 57,000 | .004500 | .000900 | ..... | ..... | |
| 20,060 | 100,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 100,300 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .1700 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | granular, silky spot at circumference |
| Elongation of inch sections | | ".22* ".12 |

## JACKET.

## No. 6079.

Marks, $\frac{1408\ B_1\ F_3}{B\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000400 | 0. | ..... | |
| 9,200 | 46,000 | .001650 | .000200 | .000050 | .000050 | |
| 9,400 | 47,000 | .001700 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001800 | .000100 | ..... | ..... | |
| 9,800 | 49,000 | .001950 | .000150 | ..... | ..... | |
| 10,000 | 50,000 | .002050 | .000100 | ..... | ..... | Elastic limit. |
| 10,200 | 51,000 | .002750 | .000700 | ..... | ..... | |
| 10,400 | 52,000 | .004450 | .001700 | ..... | ..... | |
| 10,600 | 53,000 | .005000 | .000550 | ..... | ..... | |
| 10,800 | 54,000 | .006000 | .001000 | ..... | ..... | |
| 11,000 | 55,000 | .006650 | .000650 | ..... | ..... | |
| 19,410 | 97,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 97,050 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | granular, 80 per cent; silky flaky, 20 per cent |
| Elongation of inch, sections | | ".16, ".24* |

*TABULATION OF TENSION SPECIMENS FROM 3.2-INCH B. L. STEEL FIELD GUNS. (STEMS 2" LONG, ".505 DIAMETER.)*

| No. of test. | Position in gun. | Location of specimens. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Pounds.* | *Pounds.* | *Pr. ct.* | *Pr. ct.* | | |
| 6014 | Tube ..... | Middle . | 49,000 | 90,900 | 22.5 | 43.3 | Silky, oblique..... | Muzzle end. |
| 6065 | .....do .... | ....do ... | 49,000 | 95,100 | 21.5 | 34.0 | Granular, radiating from a silky spot in circumference. | Breech end. |
| 6127 | .....do .... | ....do ... | 48,000 | 91,000 | 22.0 | 43.3 | Silky..... | Muzzle end. |
| 6034 | Jacket .... | ....do ... | 53,000 | 94,400 | 15.5 | 16.9 | Granular..... | Do. |
| 6067 | .....do .... | ....do ... | 50,000 | 94,400 | 22.5 | 37.1 | Silky, trace of granulation at circumference. | Breech end. |
| 6077 | .....do .... | ....do ... | 52,000 | 100,300 | 17.0 | 30.7 | Granular, silky spot at circumference. | Muzzle end. |
| 6079 | .....do .... | ....do ... | 50,000 | 97,050 | 20.0 | 27.4 | Granular, 80 per cent; silky flaky, 20 per cent. | Breech end. |

# 3.6-INCH B. L. FIELD MORTARS.

## SPECIMENS FROM BODIES, BREECH BLOCKS, SPINDLES, AND GAS CHECKS.

## Steel Bodies.

| Marks. | Diameter. | Sectional area. | Elastic limit. | | Tensile strength. | | Elongation in 2 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total. | Per square inch. | Total. | Per square inch. | | | | | |
| | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per ct.* | *In. Sq. in.* | *Per ct.* | |
| 1 | .505 | .20 | 11,000 | 55,000 | 18,510 | 92,550 | .38 | 19.0 | Diam.. .42=.1385 | 30.7 | Granular, 60 per cent; silky lamellar, 40 per cent. |
| 2 | .505 | .20 | 10,980 | 54,900 | 19,410 | 97,050 | .35 | 17.5 | Diam.. .42=.1385 | 30.7 | Granular; silky eccentric spot. |
| 3 | .505 | .20 | 10,200 | 51,000 | 18,090 | 90,450 | .45 | 22.5 | Diam.. .40=.1257 | 37.1 | Granular, 60 per cent; silky, 40 per cent. |
| 4 | .505 | .20 | 9,220 | 46,100 | 17,420 | 97,100 | .39 | 19.5 | Diam.. .42=.1385 | 30.7 | Granular; silky serrated at the circumference. |
| 5 | .505 | .20 | 11,450 | 57,250 | 18,580 | 92,900 | .39 | 19.5 | Diam.. .41=.1320 | 34.0 | Granular; flaky streak. |
| 6 | .505 | .20 | 10,020 | 50,100 | 17,940 | 89,700 | .41 | 20.5 | Diam.. .41=.1320 | 34.0 | Granular, 60 per cent; dull flaky, 40 per cent. |
| 7 | .505 | .20 | 10,510 | 52,550 | 17,800 | 89,000 | .46 | 23.0 | Diam.. .39=.1194 | 40.3 | Silky. |
| 8 | .505 | .20 | 11,520 | 57,600 | 18,870 | 94,350 | .42 | 21.0 | Diam.. .38=.1134 | 43.3 | Do. |
| 9 | .505 | .20 | 11,840 | 59,200 | 19,810 | 99,050 | .39 | 19.5 | Diam.. .42=.1385 | 30.7 | Granular, 70 per cent; silky flaky, 30 per cent. |
| 10 | .505 | .20 | 9,420 | 47,100 | 17,340 | 86,700 | .45 | 22.5 | Diam.. .39=.1194 | 40.3 | Granular, 55 per cent; silky flaky, 45 per cent. |
| 11 | .505 | .20 | 11,400 | 57,000 | 18,960 | 94,800 | .37 | 18.5 | Diam.. .44=.1521 | 23.9 | Granular; flaky spot at the circumference. |
| 12 | .505 | .20 | 9,620 | 48,100 | 17,880 | 89,400 | .42 | 21.0 | Diam.. .42=.1385 | 30.7 | Granular; flaky streak. |
| 13 | .505 | .20 | 11,920 | 59,600 | 18,930 | 94,650 | .41 | 20.5 | Diam.. .41=.1320 | 34.0 | Granular, 50 per cent; silky flaky, 50 per cent. |
| 14 | .505 | .20 | 12,650 | 63,250 | 20,520 | 102,600 | .34 | 17.0 | Diam.. .43=.1452 | 27.4 | Granular; silky serrated at the circumference. |
| 15 | .505 | .20 | 9,460 | 47,300 | 17,130 | 85,650 | .49 | 24.5 | Diam.. .40=.1257 | 37.1 | Granular, 60 per cent; silky serrated, 40 per cent. |
| 16 | .505 | .20 | 12,710 | 63,550 | 20,030 | 100,150 | .37 | 18.5 | Diam.. .42=.1385 | 30.7 | Do. |
| 17 | .505 | .20 | 10,320 | 51,600 | 17,820 | 89,100 | .42 | 21.0 | Diam.. .41=.1320 | 34.0 | Silky flaky, 80 per cent; granular, 20 per cent. |
| 18 | .505 | .20 | 12,520 | 62,600 | 18,700 | 93,500 | .37 | 18.5 | Diam.. .43=.1452 | 27.4 | Granular; flaky streak. |
| 19 | .505 | .20 | 12,650 | 63,250 | 20,220 | 101,100 | .34 | 17.0 | Diam.. .42=.1385 | 30.7 | Granular; serrated section across fractured surface. |
| 20 | .505 | .20 | 11,480 | 57,400 | 19,140 | 95,700 | .37 | 18.5 | Diam.. .43=.1452 | 27.4 | Granular; flaky eccentric spot. |
| 21 | .505 | .20 | 10,180 | 50,900 | 17,690 | 88,450 | .42 | 21.0 | Diam.. .40=.1257 | 37.1 | Silky; oblique. |
| 22 | .505 | .20 | 11,200 | 56,000 | 18,080 | 90,400 | .40 | 20.0 | Diam.. .40=.1257 | 37.1 | Dull silky; oblique. |
| 23 | .505 | .20 | 11,380 | 56,900 | 19,480 | 97,400 | .40 | 20.0 | Diam.. .40=.1257 | 37.1 | Silky, 50 per cent; granular, 50 per cent. |
| 24 | .505 | .20 | 12,550 | 62,750 | 20,070 | 100,350 | .36 | 18.0 | Diam.. .41=.1320 | 34.0 | Granular; silky center. |
| 25 | .505 | .20 | 11,390 | 56,950 | 18,220 | 91,100 | .40 | 20.0 | Diam.. .39=.1194 | 40.3 | Silky. |
| 26 | .505 | .20 | 11,770 | 58,850 | 19,380 | 96,900 | .34 | 17.0 | Diam.. .45=.1590 | 20.5 | Granular; flaky spot at the circumference. |
| 27 | .505 | .20 | 11,300 | 56,500 | 19,020 | 95,100 | .37 | 18.5 | Diam.. .45=.1590 | 20.5 | Do. |
| 28 | .505 | .20 | 10,320 | 51,600 | 18,420 | 92,100 | .39 | 19.5 | Diam.. .42=.1385 | 30.7 | Granular, 40 per cent; silky serrated, 60 per cent. |
| 29 | .505 | .20 | 11,180 | 55,900 | 17,940 | 89,700 | .41 | 20.5 | Diam.. .40=.1257 | 37.1 | Granular, 50 per cent; silky flaky, 50 per cent. |
| 30 | .505 | .20 | 10,960 | 54,800 | 18,470 | 92,350 | .36 | 18.0 | Diam.. .43=.1452 | 27.4 | Granular; flaky spot at the circumference. |
| 31 | .505 | .20 | 9,620 | 48,100 | 17,280 | 86,400 | .45 | 22.5 | Diam.. .41=.1320 | 34.0 | Silky serrated, 60 per cent; granular, 40 per cent. |
| 32 | .505 | .20 | 10,250 | 51,250 | 17,910 | 89,550 | .42 | 21.0 | Diam.. .40=.1257 | 37.1 | Silky serrated; trace of granulation. |

## Steel Breech Blocks.

| Marks. | Diameter. | Sectional area. | Elastic limit. Total. | Elastic limit. Per square inch. | Tensile strength. Total. | Tensile strength. Per square inch. | Elongation in 2 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per ct.* | *In. Sq. in.* | *Per ct.* | |
| 2 | .505 | .20 | 13,640 | 68,200 | 21,030 | 105,150 | .33 | 16.5 | Diam.. .40=.1257 | 37.1 | Silky. |
| 5 | .505 | .20 | 10,180 | 50,900 | 17,160 | 85,800 | .27 | 27.0 | Diam.. .41=.1320 | 34.0 | Granular, 60 per cent; lamellar, 40 per cent. |
| 10 | .505 | .20 | 12,950 | 64,750 | 19,420 | 97,100 | .19 | 19.0 | Diam.. .44=.1521 | 23.9 | Granular; radiating from a lamellar spot at circumference. |
| 13 | .505 | .20 | 11,960 | 59,800 | 17,900 | 89,500 | .36 | 18.0 | Diam.. .41=.1320 | 34.0 | Granular, 60 per cent; silky serrated, 40 per cent. |
| 17 | .505 | .20 | 13,280 | 66,400 | 19,260 | 96,300 | .38 | 19.0 | Diam.. .41=.1320 | 34.0 | Granular; flaky streak across fracture. |
| 21 | .505 | .20 | 12,510 | 62,550 | 18,510 | 92,550 | .36 | 18.0 | Diam.. .43=.1452 | 27.4 | Granular; flaky spot at circumference. |
| 25 | .505 | .20 | 12,710 | 63,550 | 18,780 | 93,900 | .36 | 18.0 | Diam.. .41=.1320 | 34.0 | Granular, 70 per cent; silky serrated, 30 per cent. |
| 29 | .505 | .20 | 13,500 | 67,500 | 19,760 | 98,800 | .37 | 18.5 | Diam.. .42=.1385 | 30.7 | Granular; silky serrated spot. |

## Steel Spindles.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | .505 | .20 | 12,320 | 61,600 | 19,580 | 97,900 | .49 | 24.5 | Diam.. .32=.0804 | 59.8 | Fine silky. |
| 5 | .505 | .20 | 11,640 | 58,200 | 18,490 | 92.450 | .52 | 26.0 | Diam.. .32=.0804 | 59.8 | Do. |
| 10 | .505 | .20 | 11,650 | 58,250 | 18,540 | 92,700 | .50 | 25.0 | Diam.. .33=.0855 | 57.2 | Do. |
| 13 | .505 | .20 | 12,610 | 63,050 | 18,660 | 93,300 | .48 | 24.0 | Diam.. .35=.0962 | 51.9 | Fine silky; cup shaped. |
| 17 | .505 | .20 | 12,680 | 63,400 | 19,060 | 95,300 | .51 | 25.5 | Diam.. .35=.0962 | 51.9 | Do. |
| 21 | .505 | .20 | 12,520 | 62,600 | 19,440 | 97,200 | .48 | 24.0 | Diam.. .33=.0855 | 57.2 | Do. |
| 25 | .505 | .20 | 13,190 | 65,950 | 19,310 | 96,550 | .47 | 23.5 | Diam.. .34=.0908 | 54.6 | Do. |
| 29 | .505 | .20 | 13,170 | 65,850 | 19,690 | 98,450 | .47 | 23.5 | Diam.. .33=.0855 | 57.2 | Do. |

## Steel Gas Checks.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 & 28 | .505 | .20 | 15,940 | 79,700 | 24,680 | 123,400 | .34 | 17.0 | Diam.. .39=.1194 | 40.3 | Fine silky. |

# 5-INCH B. L. SIEGE RIFLES.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

## No. 6092.

Marks, $\frac{5\,R_2\,T.}{M\,T_1\,M.}$
Diameter, .505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000100 | .000050 | .000050 | |
| 8,600 | 43,000 | .001550 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001600 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001600 | 0. | ..... | ..... | |
| 9,200 | 46,000 | .001650 | .000050 | ..... | ..... | |
| 9,400 | 47,000 | .001700 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001750 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001800 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001900 | .000100 | ..... | ..... | Elastic limit. |
| 10,200 | 51,000 | .002100 | .000200 | ..... | ..... | |
| 10,400 | 52,000 | .002600 | .000500 | ..... | ..... | |
| 10,600 | 53,000 | .003950 | .001350 | ..... | ..... | |
| 10,800 | 54,000 | .005900 | .001950 | ..... | ..... | |
| 11,000 | 55,000 | .006950 | .001050 | ..... | ..... | |
| 18,300 | 91,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,500 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2500 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ″.95 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.85*, ″.15 |

## TUBE.

## No. 6098.

Marks, $\frac{5\ R_2\ T}{M\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000100 | .000050 | .000050 | |
| 8,600 | 43,000 | .001550 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001600 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001600 | 0. | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .001750 | .000150 | ..... | ..... | |
| 9,400 | 47,000 | .001850 | .000100 | ..... | ..... | |
| 9,600 | 48,000 | .001950 | .000100 | ..... | ..... | |
| 9,800 | 49,000 | .002200 | .000250 | ..... | ..... | |
| 10,000 | 50,000 | .002450 | .000250 | ..... | ..... | |
| 10,200 | 51,000 | .002950 | .000500 | ..... | ..... | |
| 10,400 | 52,000 | .003900 | .000950 | ..... | ..... | |
| 10,600 | 53,000 | .004950 | .001050 | ..... | ..... | |
| 17,460 | 87,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 87,300 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".50 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".33*, ".09 |

## TUBE.

## No. 6358.

Marks, $\frac{14424\ B_2}{MT_2M}$
Diameter, ".504.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000100 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000100 | .000050 | .000050 | |
| 9,800 | 49,000 | .001850 | .000400 | ..... | ..... | Elastic limit. |
| 10,000 | 50,000 | .002000 | .000150 | ..... | ..... | |
| 10,200 | 51,000 | .002750 | .000750 | ..... | ..... | |
| 10,400 | 52,000 | .004500 | .001750 | ..... | ..... | |
| 10,600 | 53,000 | .006000 | .001500 | ..... | ..... | |
| 10,800 | 54,000 | .007000 | .001000 | ..... | ..... | |
| 18,430 | 92,150 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,150 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2500 |
| Elongation per inch under strain at elastic limit | do... | .001850 |
| Reduction in diameter at point of rupture | do... | .114 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".34* |

## TUBE.

### No. 6393.

Marks, $\frac{5\ R_2\ T}{B\ T_2\ M}$
Diameter, ".510.
Sectional area, .204 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 204 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,020 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,040 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,080 | 20,000 | .000700 | .000300 | ..... | ..... | |
| 6,120 | 30,000 | .001050 | .000350 | ..... | ..... | |
| 7,140 | 35,000 | .001300 | .000250 | 0. | ..... | |
| 8,160 | 40,000 | .001400 | .000100 | ..... | ..... | |
| 8,568 | 42,000 | .001450 | .000050 | 0. | ..... | |
| 9,180 | 45,000 | .001550 | .000100 | ..... | ..... | |
| 10,200 | 50,000 | .001700 | .000150 | ..... | ..... | |
| 10,404 | 51,000 | .001750 | .000050 | ..... | ..... | |
| 10,608 | 52,000 | .001850 | .000100 | ..... | ..... | Elastic limit. |
| 10,812 | 53,000 | .002050 | .000200 | ..... | ..... | |
| 11,016 | 54,000 | .003000 | .000950 | ..... | ..... | |
| 11,220 | 55,000 | .004750 | .001750 | ..... | ..... | |
| 11,424 | 56,000 | .006000 | .001250 | ..... | ..... | |
| 11,628 | 57,000 | .007300 | .001300 | ..... | ..... | |
| 18,480 | 90,590 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,590 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001850 |
| Reduction in diameter at point of rupture | do... | .130 |
| Reduction in area after rupture, per cent of original section | | 44.4 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".11, ".32* |

## TUBE.

### No. 6394.

Marks, $\frac{5\ R_1 \cdot T}{B\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000100 | 0. | ..... | |
| 9,600 | 48,000 | .001600 | .000150 | ..... | ..... | |
| 9,800 | 49,000 | .001650 | .000050 | ..... | ..... | Elastic limit. |
| 10,000 | 50,000 | .002150 | .000500 | ..... | ..... | |
| 10,200 | 51,000 | .004000 | .001850 | ..... | ..... | |
| 10,400 | 52,000 | .004450 | .000450 | ..... | ..... | |
| 10,600 | 53,000 | .006250 | .000800 | ..... | ..... | |
| 10,800 | 54,000 | .006550 | .001300 | ..... | ..... | |
| 17,960 | 89,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,800 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky serrated, 60 per cent; granular, 40 per cent |
| Elongation of inch sections | | ".25*, ".15 |

## TUBE.

## No. 6403.

Marks, $\frac{14484\ B}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000100 | .000050 | .000050 | |
| 8,600 | 43,000 | .001500 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001550 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001600 | .000050 | ..... | ..... | |
| 9,200 | 46,000 | .001650 | .000050 | ..... | ..... | |
| 9,400 | 47,000 | .001750 | .000100 | ..... | ..... | Elastic limit. |
| 9,600 | 48,000 | .003500 | .001750 | ..... | ..... | |
| 9,800 | 49,000 | .004500 | .001000 | ..... | ..... | |
| 10,000 | 50,000 | .005150 | .000650 | ..... | ..... | |
| 10,200 | 51,000 | .006500 | .001350 | ..... | ..... | |
| 10,400 | 52,000 | .007500 | .001000 | ..... | ..... | |
| 17,980 | 89,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,900 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2550 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .134 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".75 from neck. |
| Character of broken surface | | silky. |
| Elongation of inch sections | | ".37*, ".14 |

## JACKET.

## No. 6110.

Marks, $\frac{5\ B_1\ J}{M\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 11,500 | 46,000 | .001667 | .000300 | .000033 | .000033 | |
| 11,750 | 47,000 | .001733 | .000066 | ..... | ..... | |
| 12,000 | 48,000 | .001767 | .000034 | ..... | ..... | Elastic limit. |
| 12,250 | 49,000 | .006667 | .004900 | ..... | ..... | |
| 12,500 | 50,000 | .007333 | .000666 | ..... | ..... | |
| 12,750 | 51,000 | .008167 | .000834 | ..... | ..... | |
| 13,000 | 52,000 | .008400 | .000233 | ..... | ..... | |
| 13,250 | 53,000 | .009000 | .000600 | ..... | ..... | |
| 22,080 | 88,320 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,320 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2267 |
| Elongation per inch under strain at elastic limit | do... | .001767 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1″.2 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.14, ″.27*, ″.27* |

## JACKET.

### No. 6122.

Marks, $\frac{5\ R_{18}\ J}{B\ T_1\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 11,250 | 45,000 | .001567 | .000200 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .002500 | .000933 | ..... | ..... | |
| | | .011667 | .009167 | .009733 | .009733 | |
| 11,750 | 47,000 | .012667 | .001000 | ..... | ..... | |
| 12,000 | 48,000 | .013333 | .000666 | ..... | ..... | |
| 12,250 | 49,000 | .013933 | .000600 | ..... | ..... | |
| 12,500 | 50,000 | .014833 | .000900 | ..... | ..... | |
| 20,620 | 82,480 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 82,480 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | ".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".35*, ".21, ".16 |

## JACKET.

## No. 6178.

Marks, $\frac{11714\ B}{M\ T_2\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 10,000 | 40,000 | .001433 | .000400 | .000067 | .000067 | |
| 11,500 | 46,000 | .001700 | .000267 | .000133 | .000066 | Elastic limit. |
| 11,750 | 47,000 | .002500 | .000800 | ..... | ..... | |
| 12,000 | 48,000 | .003667 | .001167 | ..... | ..... | |
| 12,250 | 49,000 | .004900 | .001233 | ..... | ..... | |
| 12,500 | 50,000 | .005933 | .001033 | ..... | ..... | |
| 12,750 | 51,000 | .006433 | .000500 | ..... | ..... | |
| 13,000 | 52,000 | .007333 | .000900 | ..... | ..... | |
| 23,270 | 93,080 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 93,080 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 36.4 |
| Position of rupture | | ".35 from neck |
| Character of broken surface | | granular 50 per cent, silky 50 per cent |
| Elongation of inch sections | | ".29*, ".11, ".09 |

## JACKET.

## No. 6336.

Marks, $\frac{14461\ B_2}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length. 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001333 | .000333 | .000033 | .000033 | |
| 11,250 | 45,000 | .001500 | .000167 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .005667 | .004167 | .003967 | .003934 | |
| 11,750 | 47,000 | .008667 | .003000 | ..... | ..... | |
| 12,000 | 48,000 | .009667 | .001000 | ..... | ..... | |
| 12,250 | 49,000 | .010400 | .000733 | ..... | ..... | |
| 12,500 | 50,000 | .011567 | .001167 | ..... | ..... | |
| 20,090 | 80,360 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,360 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2367 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".36*, ".19, ".16 |

## JACKET.

## No. 6350.

Marks, $\frac{5\ R_{15}\ J}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 10,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 11,500 | 46,000 | .001533 | .000233 | ..... | ..... | |
| 12,500 | 50,000 | .001667 | .000134 | ..... | ..... | |
| 13,750 | 55,000 | .001833 | .000166 | ..... | ..... | |
| 14,000 | 56,000 | .001900 | .000067 | ..... | ..... | |
| 14,250 | 57,000 | .001967 | .000067 | ..... | ..... | Elastic limit. |
| 14,500 | 58,000 | .002667 | .000700 | ..... | ..... | |
| 14,750 | 59,000 | .004333 | .001666 | ..... | ..... | |
| 15,000 | 60,000 | .006333 | .002000 | ..... | ..... | |
| 15,250 | 61,000 | .007333 | .001000 | ..... | ..... | |
| 15,500 | 62,000 | .008433 | .001100 | ..... | ..... | |
| 23,590 | 94,360 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,360 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .001967 |
| Reduction in diameter at point of rupture | do... | .114 |
| Reduction in area after rupture, per cent of original section | | 36.4 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | granular, 60 per cent; silky, 40 per cent |
| Elongation of inch sections | | .".09, .".12, .".28* |

## JACKET.

## No. 6351.

Marks, $\frac{5\ B_{M}\ J}{T\ O}$
Diameter ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 11,500 | 46,000 | .001533 | .000200 | ..... | ..... | |
| 12,500 | 50,000 | .001700 | .000167 | ..... | ..... | |
| 14,500 | 58,000 | .002000 | .000300 | ..... | ..... | |
| 14,750 | 59,000 | .002033 | .000033 | ..... | ..... | Elastic limit. |
| 15,000 | 60,000 | .002200 | .000167 | ..... | ..... | |
| 15,250 | 61,000 | .002333 | .000133 | ..... | ..... | |
| 15,500 | 62,000 | .002767 | .000434 | ..... | ..... | |
| 15,750 | 63,000 | .004333 | .001566 | ..... | ..... | |
| 16,000 | 64,000 | .006667 | .002334 | ..... | ..... | |
| 24,540 | 98,160 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 98,160 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .1933 |
| Elongation per inch under strain at elastic limit | do... | .002033 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".12, ".32*, ".14 |

## JACKET.

## No. 6376.

Marks, $\frac{14447\ B_4}{M\ T_2}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000867 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 11,500 | 46,000 | .001567 | .000234 | 0. | ..... | |
| 11,750 | 47,000 | .001600 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001633 | .000033 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000067 | ..... | ..... | |
| 12,500 | 50,000 | .001733 | .000033 | ..... | ..... | Elastic limit. |
| 12,750 | 51,000 | .003167 | .001434 | ..... | ..... | |
| 13,000 | 52,000 | .006667 | .003500 | ..... | ..... | |
| 13,250 | 53,000 | .007000 | .000333 | ..... | ..... | |
| 13,500 | 54,000 | .007667 | .000667 | ..... | ..... | |
| 13,750 | 55,000 | .008500 | .000833 | ..... | ..... | |
| 23,740 | 94,960 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,960 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001733 |
| Reduction in diameter at point of rupture | do... | .114 |
| Reduction in area after rupture, per cent of original section | | 36.4 |
| Position of rupture | | 1″.2 from neck |
| Character of broken surface | | silky, flaky, 30 per cent; granular, 70 per cent |
| Elongation of inch sections | | ″.25, ″.22⁸, ″.16 |

*TABULATION OF TENSION SPECIMENS FROM 5-INCH B. L. SIEGE RIFLES (STEMS OF SPECIMENS FROM TUBES 2″ LONG, ″.505 DIAMETER).*

| No. of test. | Position in gun. | Location of specimens. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Pounds.* | *Pounds.* | *P. ct.* | *P. ct.* | | |
| 6092 | Tube | Middle | 50,000 | 91,500 | 25.0 | 46.2 | Silky | Muzzle end. |
| 6093 | do | do | 45,000 | 87,300 | 21.0 | 46.2 | do | Do. |
| 6353 | do | do | 49,000 | 92,150 | 25.0 | 40.3 | do | Do. |
| 6393 | do | do | 52,000 | 90,590 | 21.5 | 44.4 | do | Breech end. |
| 6394 | do | do | 49,000 | 89,800 | 20.0 | 34.0 | Silky, serrated, 60 per cent; granular, 40 per cent. | Do. |
| 6403 | do | do | 47,000 | 89,900 | 25.5 | 46.2 | Silky | Muzzle end. |
| STEMS OF SPECIMENS FROM JACKETS 3″ LONG, ″.564 DIAMETER. | | | | | | | | |
| 6110 | Jacket | Outside. | 48,000 | 88,320 | 22.7 | 44.6 | Silky | Muzzle end. |
| 6122 | do | Middle | 45,000 | 82,480 | 24.0 | 49.7 | do | Breech end. |
| 6178 | do | do | 46,000 | 93,080 | 16.3 | 36.4 | Granular, 50 per cent; silky, 50 per cent. | Muzzle end. |
| 6336 | do | do | 45,000 | 80,360 | 23.7 | 49.7 | Silky | Breech end. |
| 6350 | do | Outside. | 57,000 | 94,360 | 16.3 | 36.4 | Granular, 60 per cent; silky, 40 per cent. | Muzzle end. |
| 6351 | do | do | 59,000 | 98,160 | 19.3 | 44.6 | Silky | Do. |
| 6376 | do | Middle | 50,000 | 94,960 | 21.0 | 36.4 | Silky, flaky, 30 per cent; granular, 70 per cent. | Do. |

# 5-INCH R. F. GUNS.

## SPECIMENS FROM JACKETS.

## JACKET.

## No. 5988.

Marks, $\frac{10156\ B}{B\ T_1\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000167 | ..... | ..... | |
| 5,000 | 20,000 | .000567 | .000300 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000400 | ..... | ..... | |
| 10,000 | 40,000 | .001300 | .000333 | 0. | ..... | |
| 11,500 | 46,000 | .001533 | .000233 | 0. | ..... | |
| 11,750 | 47,000 | .001567 | .000034 | ..... | ..... | |
| 12,000 | 48,000 | .001600 | .000033 | ..... | ..... | |
| 12,250 | 49,000 | .001633 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001667 | .000034 | ..... | ..... | Elastic limit. |
| 12,750 | 51,000 | .001833 | .000166 | ..... | ..... | |
| 13,000 | 52,000 | .002400 | .000567 | ..... | ..... | |
| 13,250 | 53,000 | .003167 | .000767 | ..... | ..... | |
| 13,500 | 54,000 | .003667 | .000500 | ..... | ..... | |
| 13,750 | 55,000 | .004200 | .000533 | ..... | ..... | |
| 23,820 | 95,280 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,280 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .001667 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".21 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".20*, ".21* |

## JACKET.

## No. 6015.

Marks, $\frac{11268\ B_4}{M\ T_1\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 10,000 | 40,000 | .001400 | .000367 | ..... | ..... | |
| 11,500 | 46,000 | .001633 | .000233 | .000033 | .000033 | |
| 11,750 | 47,000 | .001667 | .000034 | ..... | ..... | |
| 12,000 | 48,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,250 | 49,000 | .002667 | .000967 | ..... | ..... | |
| 12,500 | 50,000 | .006167 | .003500 | ..... | ..... | |
| 12,750 | 51,000 | .007333 | .001166 | ..... | ..... | |
| 13,000 | 52,000 | .008000 | .000667 | ..... | ..... | |
| 13,250 | 53,000 | .008867 | .000867 | ..... | ..... | |
| 22,190 | 88,760 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,760 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2433 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".14, ".35*, ".24 |

## JACKET.

## No. 6064.

Marks, $\frac{11466\ B_2}{M\ T_2\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000700 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001067 | .000367 | ..... | ..... | |
| 10,000 | 40,000 | .001467 | .000400 | 0. | ..... | |
| 11,500 | 46,000 | .001667 | .000200 | 0. | ..... | |
| 11,750 | 47,000 | .001700 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001767 | .000067 | ..... | ..... | |
| 12,250 | 49,000 | .001833 | .000066 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .001967 | .000134 | ..... | ..... | |
| 12,750 | 51,000 | .002300 | .000333 | ..... | ..... | |
| 13,000 | 52,000 | .003333 | .001033 | ..... | ..... | |
| 13,250 | 53,000 | .004767 | .001434 | ..... | ..... | |
| 13,500 | 54,000 | .006167 | .001400 | ..... | ..... | |
| 23,420 | 93,680 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 93,680 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001833 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".15 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".11, ".24, ".28* |

## JACKET.

## No. 6153.

Marks, $\frac{11466\ B}{M\ T,\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 11,500 | 46,000 | .001600 | .000233 | .000033 | .000033 | |
| 11,750 | 47,000 | .001633 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001667 | .000034 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .002200 | .000500 | ..... | ..... | |
| 12,750 | 51,000 | .003333 | .001133 | ..... | ..... | |
| 13,000 | 52,000 | .006333 | .003000 | ..... | ..... | |
| 13,250 | 53,000 | .007167 | .000834 | ..... | ..... | |
| 13,500 | 54,000 | .007667 | .000500 | ..... | ..... | |
| 23,710 | 94,840 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,840 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .134 |
| Reduction in area after rupture, per cent of original section | | 41.9 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".30*, ".19, ".11 |

## JACKET.

## No. 6253.

Marks, $\frac{11497\ B}{B\ T, M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000567 | .000300 | ..... | ..... | |
| 7,500 | 30,000 | .000933 | .000366 | ..... | ..... | |
| 10,000 | 40,000 | .001300 | .000367 | 0. | ..... | |
| 11,500 | 46,000 | .001400 | .000100 | 0. | ..... | |
| 11,750 | 47,000 | .001467 | .000067 | ..... | ..... | |
| 12,000 | 48,000 | .001500 | .000033 | ..... | ..... | |
| 12,250 | 49,000 | .001567 | .000067 | ..... | ..... | |
| 12,500 | 50,000 | .001600 | .000033 | ..... | ..... | |
| 12,750 | 51,000 | .001633 | .000033 | ..... | ..... | Elastic limit. |
| 13,000 | 52,000 | .002033 | .000400 | ..... | ..... | |
| 13,250 | 53,000 | .005433 | .003400 | ..... | ..... | |
| 13,500 | 54,000 | .006400 | .000967 | ..... | ..... | |
| 13,750 | 55,000 | .007033 | .000633 | ..... | ..... | |
| 14,000 | 56,000 | .008333 | .001300 | ..... | ..... | |
| 22,890 | 91,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,560 |
| Elastic limit per square inch of original section | do... | 51,000 |
| Elongation per inch after rupture | inch... | .2267 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .134 |
| Reduction in area after rupture, per cent of original section | | 41.9 |
| Position of rupture | | "1.35 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".20, ".35, * ".13 |

*TABULATION OF TENSION SPECIMENS FROM 5-INCH R. F. GUNS (STEMS 3" LONG, ".564 DIAMETER).*

| No. of test. | Position in gun. | Location of specimens. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Pounds.* | *Pounds.* | *Per ct.* | *Per ct.* | | |
| 6016 | Jacket.... | Middle . | 50,000 | 95,280 | 16.3 | 44.6 | Silky..... | Breech end. |
| 6015 | ....do..... | ....do... | 48,000 | 88,760 | 24.3 | 44.6 | Silky, oblique..... | Muzzle end. |
| 6064 | ....do..... | ....do... | 49,000 | 93,680 | 21.0 | 44.6 | .....do..... | Do. |
| 6153 | ....do..... | ....do... | 49,000 | 94,840 | 20.0 | 41.9 | Silky..... | Do. |
| 6253 | ....do..... | ....do... | 51,000 | 91,560 | 22.7 | 41.9 | .....do..... | Breech end. |

# 6-INCH R. F. GUNS.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

No. 6088.

*Marks,* $^{6\ R\ F_{11}\ T}_{M\ T_2\ M}$
*Diameter,* ".505.
*Sectional area,* .20 square inch.
*Gauged length,* 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | | |
| 2,000 | 10,000 | .000300 | .000200 | | | |
| 4,000 | 20,000 | .000600 | .000300 | | | |
| 6,000 | 30,000 | .000950 | .000350 | | | |
| 7,000 | 35,000 | .001100 | .000150 | 0. | | |
| 8,000 | 40,000 | .001250 | .000150 | | | |
| 8,400 | 42,000 | .001350 | .000100 | 0. | | |
| 9,000 | 45,000 | .001450 | .000100 | | | |
| 10,000 | 50,000 | .001600 | .000150 | | | |
| 10,800 | 54,000 | .001700 | .000100 | | | Elastic limit. |
| 11,000 | 55,000 | .005500 | .003800 | | | |
| 11,200 | 56,000 | .008750 | .003250 | | | |
| 11,400 | 57,000 | .009300 | .000550 | | | |
| 11,600 | 58,000 | .010000 | .000700 | | | |
| 11,800 | 59,000 | .011000 | .001000 | | | |
| 17,970 | 89,850 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,850 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".09, ".34* |

## TUBE.

## No. 6091.

Marks, $\frac{6\ R\ F_{II}\ T}{B\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000850 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000150 | ..... | ..... | |
| 8,400 | 42,000 | .001350 | .000050 | 0. | ..... | |
| 8,600 | 43,000 | .001400 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001450 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001500 | .000050 | ..... | ..... | |
| 9,200 | 46,000 | .001550 | .000050 | ..... | ..... | |
| 9,400 | 47,000 | .001600 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001650 | .000050 | ..... | ..... | Elastic limit. |
| 9,800 | 49,000 | .001800 | .000150 | ..... | ..... | |
| 10,000 | 50,000 | .001950 | .000150 | ..... | ..... | |
| 10,200 | 51,000 | .002100 | .000150 | ..... | ..... | |
| 10,400 | 52,000 | .002400 | .000300 | ..... | ..... | |
| 10,600 | 53,000 | .003000 | .000600 | ..... | ..... | |
| 10,800 | 54,000 | .004000 | .001000 | ..... | ..... | |
| 11,000 | 55,000 | .005250 | .001250 | ..... | ..... | |
| 18,410 | 92,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,050 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .1950 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | do... | 37.1 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granulated, 40 per cent; silky center, 60 per cent |
| Elongation of inch sections | | ".10, ".29* |

## TUBE.

## No. 6094.

*Marks,* $\frac{6\,R\,F_{M}\,T}{T,M}$
*Diameter,* ".505.
*Sectional area,* .20 square inch.
*Gauged length,* 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | Initial load. |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000950 | .000450 | ..... | ..... | |
| 6,000 | 30,000 | .001100 | .000250 | ..... | ..... | |
| 7,000 | 35,000 | .001350 | .000250 | .000060 | .000060 | |
| 8,000 | 40,000 | .001450 | .000100 | ..... | ..... | |
| 8,400 | 42,000 | .001550 | .000100 | .000100 | .000050 | |
| 8,600 | 43,000 | .001600 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001700 | .000100 | ..... | ..... | |
| 9,000 | 45,000 | .001800 | .000100 | ..... | ..... | |
| 9,200 | 46,000 | .001850 | .000050 | ..... | ..... | |
| 9,400 | 47,000 | .001900 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001950 | .000050 | ..... | ..... | Elastic limit. |
| 9,800 | 49,000 | .002100 | .000150 | ..... | ..... | |
| 10,000 | 50,000 | .002400 | .000300 | ..... | ..... | |
| 10,200 | 51,000 | .002750 | .000350 | ..... | ..... | |
| 10,400 | 52,000 | .003400 | .000650 | ..... | ..... | |
| 10,600 | 53,000 | .005350 | .001950 | ..... | ..... | |
| 17,710 | 88,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,550 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001950 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".45 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".11, ".34* |

## TUBE.

## No. 6231.

Marks, $^{6\ R\ F_{IV}\ T}_{M\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000200 | 0. | ..... | |
| 8,000 | 40,000 | .001250 | .000100 | ..... | ..... | |
| 8,400 | 42,000 | .001350 | .000100 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .001800 | .000150 | ..... | ..... | |
| 11,200 | 56,000 | .001850 | .000050 | ..... | ..... | |
| 11,400 | 57,000 | .001950 | .000100 | ..... | ..... | |
| 11,600 | 58,000 | .002000 | .000050 | ..... | ..... | |
| 11,800 | 59,000 | .002050 | .000050 | ..... | ..... | Elastic limit. |
| 12,000 | 60,000 | .002450 | .000400 | ..... | ..... | |
| 12,200 | 61,000 | .003600 | .001150 | ..... | ..... | |
| 12,400 | 62,000 | .005600 | .002000 | ..... | ..... | |
| 12,600 | 63,000 | .007000 | .001400 | ..... | ..... | |
| 12,800 | 64,000 | .008050 | .001050 | ..... | ..... | |
| 19,080 | 95,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,400 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .2350 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".32 |

## TUBE.

## No. 6232.

Marks, $\frac{6\ R\ F_{is}\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | Initial load. |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001550 | .000150 | ..... | ..... | |
| 9,800 | 49,000 | .001600 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001650 | .000050 | ..... | ..... | Elastic limit. |
| 10,200 | 51,000 | .004900 | .003250 | ..... | ..... | |
| 10,400 | 52,000 | .010250 | .005350 | ..... | ..... | |
| 10,600 | 53,000 | .011000 | .000750 | ..... | ..... | |
| 10,800 | 54,000 | .012000 | .001000 | ..... | ..... | |
| 11,000 | 55,000 | .013050 | .001050 | ..... | ..... | Tensile strength. |
| 16,810 | 84,050 | ..... | ..... | ..... | ..... | |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 84,050 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2050 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | ".4 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".31*, ".10 |

## TUBE.

## No. 6234.

Marks, $\frac{6\,R\,F_{10}\,T}{M\,T_2\,M}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000150 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000100 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000250 | ..... | ..... | |
| 10,200 | 51,000 | .001750 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001800 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001850 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .001900 | .000050 | ..... | ..... | Elastic limit. |
| 11,000 | 55,000 | .004250 | .002350 | ..... | ..... | |
| 11,200 | 56,000 | .006000 | .001750 | ..... | ..... | |
| 11,400 | 57,000 | .007050 | .001050 | ..... | ..... | |
| 11,600 | 58,000 | .008450 | .001400 | ..... | ..... | |
| 11,800 | 59,000 | .009500 | .001050 | ..... | ..... | |
| 17,890 | 89,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,450 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".33 |

## JACKET.

## No. 6065.

*Marks,* $\frac{6\ R\ F_2\ J}{M\ T_1\ O}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000833 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000834 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000866 | ..... | ..... | |
| 10,000 | 40,000 | .001400 | .000867 | 0. | ..... | |
| 11,500 | 46,000 | .001600 | .000200 | 0. | ..... | |
| 11,750 | 47,000 | .001633 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001700 | .000067 | ..... | ..... | |
| 12,250 | 49,000 | .001767 | .000067 | ..... | ..... | |
| 12,500 | 50,000 | .001800 | .000033 | ..... | ..... | |
| 12,750 | 51,000 | .001833 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001867 | .000034 | ..... | ..... | |
| 13,250 | 53,000 | .001933 | .000066 | ..... | ..... | |
| 13,500 | 54,000 | .002000 | .000067 | ..... | ..... | |
| 13,750 | 55,000 | .002067 | .000067 | ..... | ..... | Elastic limit. |
| 14,000 | 56,000 | .006167 | .001100 | ..... | ..... | |
| 14,250 | 57,000 | .004333 | .001166 | ..... | ..... | |
| 14,500 | 58,000 | .006167 | .001834 | ..... | ..... | |
| 14,750 | 59,000 | .006933 | .000766 | ..... | ..... | |
| 15,000 | 60,000 | .007967 | .001034 | ..... | ..... | |
| 23,730 | 94,920 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,920 |
| Elastic limit, per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2167 |
| Elongation per inch under strain at elastic limit | do... | .002067 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".7 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".11, ".40*, ".14 |

## JACKET.

## No. 6066.

Marks, $\frac{6\ R\ F_{10}\ J}{M\ T_1\ 8}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000867 | .000234 | ..... | ..... | |
| 5,000 | 20,000 | .000700 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001067 | .000367 | ..... | ..... | |
| 10,000 | 40,000 | .001433 | .000366 | 0. | ..... | |
| 11,500 | 46,000 | .001633 | .000200 | 0. | ..... | |
| 11,750 | 47,000 | .001667 | .000034 | ..... | ..... | |
| 12,000 | 48,000 | .001700 | .000033 | ..... | ..... | |
| 12,250 | 49,000 | .001733 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001767 | .000034 | ..... | ..... | |
| 12,750 | 51,000 | .001833 | .000066 | ..... | ..... | |
| 13,000 | 52,000 | .001900 | .000067 | ..... | ..... | |
| 13,250 | 53,000 | .001933 | .000033 | ..... | ..... | Elastic limit. |
| 13,500 | 54,000 | .002933 | .001000 | ..... | ..... | |
| 13,750 | 55,000 | .003500 | .000567 | ..... | ..... | |
| 14,000 | 56,000 | .005000 | .001500 | ..... | ..... | |
| 14,250 | 57,000 | .006900 | .001900 | ..... | ..... | |
| 14,500 | 58,000 | .009100 | .002200 | ..... | ..... | |
| 22,470 | 89,880 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,880 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .2133 |
| Elongation per inch under strain at elastic limit | do... | .001933 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per centum of original section | | 47.2 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".37, ".16, ".11 |

## JACKET.

## No. 6087.

Marks, $\frac{6\ R\ F_{13}\ J}{M\ T,\ 8}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.
Stem did not run true with threaded ends.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000200 | .000200 | 0. | ..... | |
| 2,500 | 10,000 | .000433 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000800 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001233 | .000433 | ..... | ..... | |
| 8,750 | 35,000 | .001333 | .000100 | ..... | ..... | |
| 9,000 | 36,000 | .001400 | .000067 | ..... | ..... | Elastic limit. |
| 9,250 | 37,000 | .001533 | .000133 | ..... | ..... | |
| 9,500 | 38,000 | .001667 | .000134 | ..... | ..... | |
| 9,750 | 39,000 | .001833 | .000166 | ..... | ..... | |
| 10,000 | 40,000 | .002000 | .000167 | .000567 | .000567 | |
| 11,000 | 44,000 | .003000 | .001000 | ..... | ..... | |
| 11,250 | 45,000 | .004333 | .001333 | ..... | ..... | |
| 11,500 | 46,000 | .008333 | .004000 | ..... | ..... | |
| 21,340 | 85,360 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 85,360 |
| Elastic limit per square inch of original section | do... | 36,000 |
| Elongation per inch after rupture | inch.. | .2233 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | ″.15 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.33*, ″.22, ″.12 |

## JACKET.

## No. 6233.

Marks, $\frac{6\ R\ F_U\ J}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000867 | ..... | ..... | |
| 10,000 | 40,000 | .001367 | .000867 | 0. | ..... | |
| 11,500 | 46,000 | .001567 | .000200 | 0. | ..... | |
| 12,500 | 50,000 | .001700 | .000133 | ..... | ..... | |
| 12,750 | 51,000 | .001733 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001767 | .000034 | ..... | ..... | |
| 13,250 | 53,000 | .001833 | .000066 | ..... | ..... | |
| 13,500 | 54,000 | .001900 | .000067 | ..... | ..... | |
| 13,750 | 55,000 | .001967 | .000067 | ..... | ..... | |
| 14,000 | 56,000 | .002000 | .000033 | ..... | ..... | |
| 14,250 | 57,000 | .002067 | .000067 | ..... | ..... | Elastic limit. |
| 14,500 | 58,000 | .002300 | .000233 | ..... | ..... | |
| 14,750 | 59,000 | .002533 | .000233 | ..... | ..... | |
| 15,000 | 60,000 | .003033 | .000500 | ..... | ..... | |
| 15,250 | 61,000 | .003567 | .000534 | ..... | ..... | |
| 15,500 | 62,000 | .004767 | .001200 | ..... | ..... | |
| 24,480 | 97,920 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 97,920 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .1433 |
| Elongation per inch under strain at elastic limit | do... | .002067 |
| Reduction in diameter at point of rupture | do... | .124 |
| Reduction in area after rupture, per cent of original section | | 39.2 |
| Position of rupture | | ".5 from neck |
| Character of broken surface | | granular at circumference, silky center |
| Elongation of inch sections | | ".06, ".09, ".28 |

## JACKET.

## No. 6235.

Marks, $\frac{6\ R\ F_B\ J}{M\ T,\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000300 | ..... | ..... | |
| 10,000 | 40,000 | .001333 | .000366 | 0. | ..... | |
| 10,500 | 42,000 | .001367 | .000034 | 0. | ..... | |
| 12,500 | 50,000 | .001667 | .000300 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001833 | .000100 | ..... | ..... | |
| 13,500 | 54,000 | .001867 | .000034 | ..... | ..... | |
| 13,750 | 55,000 | .001900 | .000033 | ..... | ..... | Elastic limit. |
| 14,000 | 56,000 | .002100 | .000200 | ..... | ..... | |
| 14,250 | 57,000 | .002667 | .000567 | ..... | ..... | |
| 14,500 | 58,000 | .004167 | .001500 | ..... | ..... | |
| 14,750 | 59,000 | .005167 | .001000 | ..... | ..... | |
| 15,000 | 60,000 | .006600 | .001433 | ..... | ..... | |
| 23,140 | 92,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,560 |
| Elastic limit per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2167 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1".25 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".25", ".27", ".13 |

## JACKET.

## No. 6236.

Marks, $\frac{6\ R\ F_{20}\ J}{M\ T_1\ 0}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| * Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000167 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000367 | ..... | ..... | |
| 10,000 | 40,000 | .001300 | .000333 | 0. | ..... | |
| 11,500 | 46,000 | .001467 | .000167 | 0. | ..... | |
| 12,500 | 50,000 | .001667 | .000200 | ..... | ..... | |
| 12,750 | 51,000 | .001667 | 0. | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000066 | ..... | ..... | Elastic limit. |
| 13,250 | 53,000 | .001900 | .000167 | ..... | ..... | |
| 13,500 | 54,000 | .003667 | .001767 | ..... | ..... | |
| 13,750 | 55,000 | .004667 | .001000 | ..... | ..... | |
| 14,000 | 56,000 | .005800 | .001133 | ..... | ..... | |
| 14,250 | 57,000 | .006733 | .000933 | ..... | ..... | |
| 23,080 | 92,320 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,320 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001733 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".18, ".34*, ".11 |

*TABULATION OF TENSION SPECIMENS FROM 6-INCH R. F. GUNS (STEMS OF SPECIMENS FROM TUBES 2" LONG, ".505 DIAMETER).*

| Test number. | Position in gun. | Location of specimens. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Pounds.* | *Pounds.* | *Per ct.* | *Per ct.* | | |
| 6088 | Tube ..... | Middle . | 54,000 | 89,850 | 21.5 | 46.2 | Silky..... | Muzzle end. |
| 6091 | .....do .... | ...do .... | 48,000 | 92,050 | 19.5 | 37.1 | Granular 40 per cent, silky center 60 per cent. | Breech end. |
| 6094 | .....do .... | ...do .... | 48,000 | 88,550 | 22.5 | 46.2 | Silky..... | Muzzle end. |
| 6231 | .....do .... | ...do .... | 59,000 | 95,400 | 23.5 | 49.1 | .....do..... | Do. |
| 6232 | .....do .... | ...do .... | 50,000 | 84,050 | 20.5 | 51.9 | .....do..... | Do. |
| 6234 | .....do .... | ...do .... | 54,000 | 89,450 | 24.0 | 49.1 | .....do..... | Do. |

STEMS OF SPECIMENS FROM JACKETS 3" LONG, ".564 DIAMETER.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6065 | Jacket.... | Outside. | 55,000 | 94,920 | 21.7 | 44.6 | Silky..... | Muzzle end. |
| 6066 | .....do .... | ...do .... | 53,000 | 89,880 | 21.3 | 47.2 | .....do..... | Do. |
| 6087 | .....do .... | ...do ... | 36,000 | 85,360 | 22.3 | 49.7 | .....do..... | Do. |
| 6233 | .....do .... | ...do .... | 57,000 | 97,920 | 14.3 | 39.2 | Granular at the circumference, silky center. | Do. |
| 6235 | .....do .... | ...do .... | 55,000 | 92,560 | 21.7 | 47.2 | Silky..... | Do. |
| 6236 | .....do .... | ...do .... | 52,000 | 92,320 | 21.0 | 49.7 | .....do..... | Do. |

# 7-INCH B. L. SIEGE HOWITZERS.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

## No. 6148.

**Marks, B9-7T.**
**Diameter, " 505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000850 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000800 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000050 | .000050 | .000050 | |
| 8,600 | 43,000 | .001550 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001650 | .000100 | ..... | ..... | Elastic limit. |
| 9,000 | 45,000 | .004250 | .002600 | ..... | ..... | |
| 9,200 | 46,000 | .006250 | .002000 | ..... | ..... | |
| 9,400 | 47,000 | .007500 | .001250 | ..... | ..... | |
| 9,600 | 48,000 | .008150 | .000650 | ..... | ..... | |
| 9,800 | 49,000 | .009900 | .001750 | ..... | ..... | |
| 16,180 | 80,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,900 |
| Elastic limit per square inch of original section | do... | 44,000 |
| Elongation per inch after rupture | inch.. | .2550 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".05 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".33*, ".18 |

## TUBE.

## No. 6206.

Marks, $\frac{B76}{B_2}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000100 | 0. | ..... | |
| 9,400 | 47,000 | .001650 | .000150 | ..... | ..... | |
| 9,600 | 48,000 | .001700 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001750 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001800 | .000050 | ..... | ..... | |
| 10,200 | 51,000 | .001900 | .000100 | ..... | ..... | |
| 10,400 | 52,000 | .001950 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .002000 | .000050 | ..... | ..... | Elastic limit. |
| 10,800 | 54,000 | .002300 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .002750 | .000450 | ..... | ..... | |
| 11,200 | 56,000 | .003500 | .000750 | ..... | ..... | |
| 11,400 | 57,000 | .004100 | .000600 | ..... | ..... | |
| 11,600 | 58,000 | .006250 | .001150 | ..... | ..... | |
| 20,210 | 101,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 101,050 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".05 from neck |
| Character of broken surface | | silky, trace of granulation |
| Elongation of inch sections | | ".25", ".15 |

## TUBE.

### No. 6207.

Marks, $\frac{B\ 77.}{B\ 2.}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000800 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000150 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000100 | 0. | ..... | |
| 9,600 | 48,000 | .001550 | .000150 | ..... | ..... | |
| 9,800 | 49,000 | .001600 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | 0. | ..... | ..... | Elastic limit. |
| 10,200 | 51,000 | .001750 | .000150 | ..... | ..... | |
| 10,400 | 52,000 | .001950 | .000200 | ..... | ..... | |
| 10,600 | 53,000 | .003100 | .001150 | ..... | ..... | |
| 10,800 | 54,000 | .003950 | .000850 | ..... | ..... | |
| 11,000 | 55,000 | .005150 | .001200 | ..... | ..... | |
| 19,280 | 96,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 96,400 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".07 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".17, ".26". |

## JACKET.

## No. 6208.

Marks, B 101-1. B 3.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load, |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000833 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 10,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 11,500 | 46,000 | .001500 | .000167 | ..... | ..... | |
| 12,500 | 50,000 | .001667 | .000167 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001767 | .000034 | ..... | ..... | |
| 13,500 | 54,000 | .001800 | .000033 | ..... | ..... | |
| 13,750 | 55,000 | .001867 | .000067 | ..... | ..... | Elastic limit. |
| 14,000 | 56,000 | .002000 | .000133 | ..... | ..... | |
| 14,250 | 57,000 | .002200 | .000200 | ..... | ..... | |
| 14,500 | 58,000 | .002900 | .000700 | ..... | ..... | |
| 14,750 | 59,000 | .003567 | .000667 | ..... | ..... | |
| 15,000 | 60,000 | .005000 | .001433 | ..... | ..... | |
| 25,080 | 100,120 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 100,120 |
| Elastic limit per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2133 |
| Elongation per inch under strain at elastic limit | do... | .001867 |
| Reduction in diameter at point of rupture | do... | .124 |
| Reduction in area after rupture, per cent of original section | | 89.2 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".17, ".28*, ".19 |

## JACKET.

## No. 6277.

Marks, $\frac{B\text{-}35\text{-}75}{M_1}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 5,000 | 20,000 | .000533 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 10,000 | 40,000 | .001300 | .000333 | 0. | ..... | |
| 11,500 | 46,000 | .001533 | .000233 | 0. | ..... | |
| 12,500 | 50,000 | .001667 | .000134 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001767 | .000034 | ..... | ..... | |
| 13,500 | 54,000 | .001833 | .000066 | ..... | ..... | Elastic limit. |
| 13,750 | 55,000 | .001933 | .000100 | ..... | ..... | |
| | | .004000 | .002067 | ..... | ..... | |
| 14,000 | 56,000 | .005667 | .001667 | ..... | ..... | |
| 14,250 | 57,000 | .006900 | .001233 | ..... | ..... | |
| 14,500 | 58,000 | .008000 | .001100 | ..... | ..... | |
| 14,750 | 59,000 | .008667 | .000667 | ..... | ..... | |
| 23,820 | 95,280 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,280 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .001833 |
| Reduction in diameter at point of rupture | do... | .134 |
| Reduction in area after rupture, per cent of original section | | 41.9 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, traces of granulation |
| Elongation of inch sections | | ".10, ".32, ".11 |

## *TABULATION OF TENSION SPECIMENS FROM 7-INCH B. L. SIEGE HOWITZERS.*

STEMS OF SPECIMENS FROM TUBES 2" LONG, ".505 DIAMETER.

| No. of test. | Position in gun. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|
| | | *Pounds.* | *Pounds.* | *Per. ct.* | *Per. ct.* | | |
| 6146 | Tube ..... | 44,000 | 80,900 | 25.5 | 42.3 | Silky, oblique..... | Breech end. |
| 6206 | .....do .... | 58,000 | 101,050 | 20.0 | 37.1 | Silky, trace of granulation... | Do. |
| 6207 | .....do .... | 50,000 | 96,400 | 21.5 | 40.3 | Silky ..... | Do. |

STEMS OF SPECIMENS FROM JACKETS 3" LONG, ".564 DIAMETER.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6208 | Jacket .... | 55,000 | 100,120 | 21.3 | 39.2 | Silky ..... | Breech end. |
| 6277 | .....do .... | 54,000 | 95,280 | 17.7 | 41.9 | Silky, trace of granulation... | Do. |

# 10-INCH STEEL B. L. RIFLES.

## SPECIMEN FROM JACKET.

## JACKET.

## No. 6209.

Marks, $\frac{7948\ B_1}{M\ T_5\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauge length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000833 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000700 | .000867 | ..... | ..... | |
| 7,500 | 30,000 | .001067 | .000867 | ..... | ..... | |
| 8,750 | 35,000 | .001267 | .000200 | .000083 | .000083 | |
| 10,000 | 40,000 | .001400 | .000133 | ..... | ..... | |
| 10,500 | 42,000 | .001467 | .000067 | .000083 | 0. | |
| 10,750 | 43,000 | .001500 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001567 | .000067 | ..... | ..... | |
| 11,250 | 45,000 | .001600 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001633 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001667 | .000034 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .008733 | .007066 | ..... | ..... | |
| 12,250 | 49,000 | .009100 | .000867 | ..... | ..... | |
| 12,500 | 50,000 | .009833 | .000733 | ..... | ..... | |
| 12,750 | 51,000 | .010600 | .000767 | ..... | ..... | |
| 13,000 | 52,000 | .011433 | .000833 | ..... | ..... | |
| 22,490 | 89,960 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| *Tensile strength* per square inch of original section | pounds.. | 89,960 |
| *Elastic limit* per square inch of original section | do... | 47,000 |
| *Elongation* per inch after rupture | inch.. | .2433 |
| *Elongation* per inch under strain at elastic limit | do... | .001667 |
| *Reduction* in diameter at point of rupture | do... | .154 |
| *Reduction* in area after rupture, per cent of original section | | 47.2 |
| *Position* of rupture | | ".8 from neck |
| *Character* of broken surface | | silky |
| *Elongation* of inch sections | | ".19, ".19, ".35* |

# 12-INCH STEEL B. L. RIFLES.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

## No. 6205.

*Marks*, $\frac{12452\ B_1}{M\ T_2\ M}$
*Diameter*, ".565.
*Sectional area*, .25 square inch.
*Gauged length*, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,750 | 35,000 | .001233 | .000200 | .000083 | .000083 | |
| 10,000 | 40,000 | .001400 | .000167 | .000083 | 0. | |
| 10,250 | 41,000 | .001433 | .000033 | ..... | ..... | |
| 10,500 | 42,000 | .001467 | .000034 | ..... | ..... | |
| 10,750 | 43,000 | .001533 | .000066 | ..... | ..... | |
| 11,000 | 44,000 | .001600 | .000067 | ..... | ..... | |
| 11,250 | 45,000 | .001633 | .000033 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .004667 | .003034 | ..... | ..... | |
| 11,750 | 47,000 | .007067 | .002400 | ..... | ..... | |
| 12,000 | 48,000 | .007833 | .000766 | ..... | ..... | |
| 12,250 | 49,000 | .008500 | .000667 | ..... | ..... | |
| 12,500 | 50,000 | .009833 | .000333 | ..... | ..... | |
| 22,320 | 89,280 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 89,280 |
| Elastic limit, per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .1967 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 41.9 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | "3d", ".15, ".10 |

## TUBE.

## No. 6211.

Marks, $\frac{12\ R_{29}\ T}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | .000033 | .000033 | |
| 10,250 | 41,000 | .001400 | .000033 | ..... | ..... | |
| 10,500 | 42,000 | .001433 | .000033 | ..... | ..... | |
| 10,750 | 43,000 | .001500 | .000067 | ..... | ..... | |
| 11,000 | 44,000 | .001567 | .000067 | ..... | ..... | |
| 11,250 | 45,000 | .001633 | .000066 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .013633 | .012000 | ..... | ..... | |
| 11,750 | 47,000 | .014700 | .001067 | ..... | ..... | |
| 12,000 | 48,000 | .015700 | .001000 | ..... | ..... | |
| 12,250 | 49,000 | .016633 | .000933 | ..... | ..... | |
| 12,500 | 50,000 | .017767 | .001134 | ..... | ..... | |
| 20,190 | 80,760 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,760 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2567 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".22, ".39, ".16 |

## TUBE.

### No. 6258.

*Marks,* $\frac{12\,B}{BT_1}\frac{\#}{O}\frac{T}{}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,750 | 35,000 | .001267 | .000267 | .000200 | .000200 | Elastic limit. |
| 9,000 | 36,000 | .001533 | .000266 | ..... | ..... | |
| 9,250 | 37,000 | .001833 | .000800 | ..... | ..... | |
| 9,500 | 38,000 | .002300 | .000467 | ..... | ..... | |
| 9,750 | 39,000 | .003100 | .000800 | ..... | ..... | |
| 10,000 | 40,000 | .006867 | .003767 | .005533 | .005333 | |
| 10,250 | 41,000 | .008600 | .001733 | ..... | ..... | |
| 10,500 | 42,000 | .009500 | .000900 | ..... | ..... | |
| 20,020 | 80,080 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,080 |
| Elastic limit per square inch of original section | do... | 35,000 |
| Elongation per inch after rupture | inch.. | .2333 |
| Elongation per inch under strain at elastic limit | do... | .001267 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".14,".17,".39* |

## TUBE.

## No. 6301.

Marks, $\frac{12\ E_{\infty}\ T}{B\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | 0. | ..... | |
| 12,500 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 13,000 | 52,000 | .003333 | .001633 | ..... | ..... | |
| 13,250 | 53,000 | .005000 | .001667 | ..... | ..... | |
| 13,500 | 54,000 | .008500 | .008500 | ..... | ..... | |
| 13,750 | 55,000 | .009000 | .000500 | ..... | ..... | |
| 14,000 | 56,000 | .010067 | .001067 | ..... | ..... | |
| 22,120 | 88,480 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,480 |
| Elastic limit per square inch of original section | do... | 51,000 |
| Elongation per inch after rupture | inch.. | .2083 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".10, ".13, ".38* |

## TUBE.

### No. 6349.

*Marks,* $\frac{12\ R=T}{B\ T_1\ O}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| *Total.* | *Per square inch.* | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000133 | 0. | ..... | |
| 12,500 | 50,000 | .001667 | .000367 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001767 | .000034 | ..... | ..... | |
| 13,500 | 54,000 | .001833 | .000066 | ..... | ..... | Elastic limit. |
| 13,750 | 55,000 | .001967 | .000134 | ..... | ..... | |
| 14,000 | 56,000 | .002200 | .000233 | ..... | ..... | |
| 14,250 | 57,000 | .002633 | .000433 | ..... | ..... | |
| 14,500 | 58,000 | .004333 | .001700 | ..... | ..... | |
| 14,750 | 59,000 | .005667 | .001334 | ..... | ..... | |
| 15,000 | 60,000 | .007833 | .002166 | ..... | ..... | |
| 22,500 | 90,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,000 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001833 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1.″24 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.11, ″.28*, ″.24* |

## JACKET.

## No. 6063.

Marks, $\frac{10153\ B}{B\ T_1\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | ..... | ..... | |
| 2,500 | 10,000 | .000833 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001467 | .000100 | 0. | ..... | |
| 10,750 | 43,000 | .001533 | .000066 | ..... | ..... | |
| 11,000 | 44,000 | .001567 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001600 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001633 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001667 | .000034 | ..... | ..... | |
| 12,000 | 48,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,250 | 49,000 | .001867 | .000167 | ..... | ..... | |
| 12,500 | 50,000 | .002333 | .000466 | ..... | ..... | |
| 12,750 | 51,000 | .003267 | .000934 | ..... | ..... | |
| 13,000 | 52,000 | .003933 | .000666 | ..... | ..... | |
| 13,250 | 53,000 | .004600 | .000667 | ..... | ..... | |
| 24,690 | 98,760 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 98,760 |
| Elastic limit, per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .1833 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 36.4 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".13, ".30, ".12 |

## JACKET.

## No. 6105.

*Marks,* $\frac{12\ E_{M}\ J}{M\ T_{1}\ O}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000300 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001433 | 0. | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001500 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001533 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001600 | .000067 | ..... | ..... | |
| 12,250 | 49,000 | .001633 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001667 | .000034 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000033 | ..... | ..... | Elastic limit. |
| 13,250 | 53,000 | .012667 | .010934 | ..... | ..... | |
| 13,500 | 54,000 | .013333 | .000666 | ..... | ..... | |
| 13,750 | 55,000 | .014033 | .000700 | ..... | ..... | |
| 14,000 | 56,000 | .015167 | .001134 | ..... | ..... | |
| 14,250 | 57,000 | .016600 | .001433 | ..... | ..... | |
| 21,810 | 87,240 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 87,240 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .2867 |
| Elongation per inch under strain at elastic limit | do... | .001733 |
| Reduction in diameter at point of rupture | do... | .074 |
| Reduction in area after rupture, per cent of original section | | 24.6 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".20, ".36* |

## JACKET.

## No. 6288.

Marks, $\frac{12\ R\ J}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | ..... | ..... | |
| 2,500 | 10,000 | .000300 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | 0. | 0. | |
| 10,000 | 40,000 | .001300 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001400 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001500 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001533 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001567 | .000034 | ..... | ..... | |
| 12,250 | 49,000 | .001600 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001667<br>.001800 | .000067<br>.000133 | ..... | ..... | Elastic limit. |
| 12,750 | 51,000 | .002067 | .000267 | ..... | ..... | |
| 13,000 | 52,000 | .003600 | .001533 | ..... | ..... | |
| 13,250 | 53,000 | .005333 | .001733 | ..... | ..... | |
| 13,500 | 54,000 | .006667 | .001334 | ..... | ..... | |
| 13,750 | 55,000 | .007567 | .000900 | ..... | ..... | |
| 22,390 | 89,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,560 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .001667 |
| Reduction in diameter at point of rupture | do... | .094 |
| Reduction in area after rupture, per cent of original section | | 30.6 |
| Position of rupture | | ".35 from neck |
| Character of broken surface | | granular, 85 per cent; dull, flaky streak, 15 per cent |
| Elongation of inch sections | | ".26", ".15, ".12 |

## *TABULATION OF TENSION SPECIMENS FROM 12-INCH STEEL B. L. RIFLES (STEMS 3" LONG, ".564 DIAMETER.*

| Test No. | Position in gun. | Location of specimens. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Pounds* | *Pounds.* | *P. ct.* | *P. ct.* | | |
| 5205 | Tube ..... | Middle . | 45,000 | 89,280 | 19.7 | 41.9 | Silky, oblique ..... | Muzzle end. |
| 6211 | ....do ..... | Outside. | 45,000 | 80,760 | 25.7 | 47.2 | Silky..... | Do. |
| 6258 | ....do ..... | ....do ... | 35,000 | 80,060 | 23.3 | 49.7 | .....do..... | Breech end. |
| 6801 | ....do ..... | ....do ... | 51,000 | 88,480 | 20.3 | 47.2 | .....do..... | Do. |
| 6349 | ....do ..... | ....do ... | 54,000 | 90,000 | 21.0 | 47.2 | .....do..... | Do. |
| 6063 | Jacket.... | Middle . | 48,000 | 98,760 | 18.3 | 36.4 | .....do..... | Do. |
| 6105 | ....do ..... | Outside. | 52,000 | 87,240 | 23.7 | 24.6 | ....do..... | Muzzle end. |
| 6288 | ....do ..... | ....do ... | 50,000 | 89,560 | 17.7 | 30.6 | Granular 85 per cent, dull flaky streak 15 per cent. | Do. |

# 12-INCH B. L. RIFLED MORTARS.

## SPECIMENS FROM TUBES AND JACKETS.

## TUBE.

## No. 6090.

*Marks,* $\frac{11980\ B_2}{B\ T_2\ M}$
*Diameter,* ".565.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| *Total.* | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000100 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001467 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001500 | .000066 | ..... | ..... | |
| 11,500 | 46,000 | .001567 | .000084 | ..... | ..... | |
| 11,750 | 47,000 | .001633 | .000066 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .002000 | .000867 | ..... | ..... | |
| 12,250 | 49,000 | .003000 | .001000 | ..... | ..... | |
| 12,500 | 50,000 | .005033 | .002333 | ..... | ..... | |
| 12,750 | 51,000 | .006167 | .000934 | ..... | ..... | |
| 13,000 | 52,000 | .007000 | .000833 | ..... | ..... | |
| 23,560 | 94,240 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,240 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 27.6 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | granular, radiating from a point in the circumference |
| Elongation of inch sections | | ".11, ".13, ".23* |

## TUBE.

## No. 6076.

Marks, $\frac{11486\ B_1}{B\ T_2\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000167 | ..... | ..... | |
| 10,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 11,750 | 47,000 | .001733 | .000333 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .001900 | .000167 | ..... | ..... | |
| 12,250 | 49,000 | .002267 | .000367 | ..... | ..... | |
| 12,500 | 50,000 | .003667 | .001400 | ..... | ..... | |
| 12,750 | 51,000 | .004667 | .001000 | ..... | ..... | |
| 13,000 | 52,000 | .006300 | .001633 | ..... | ..... | |
| 22,730 | 90,920 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,920 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001733 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".35*, ".12 |

## TUBE.

## No. 6134.

*Marks,* $\frac{11966\ B_2}{M\ T_2\ M}$
*Diameter,* ".565.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| *Total.* | *Per square inch.* | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001100 | .000133 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000200 | 0. | ..... | |
| 10,250 | 41,000 | .001333 | .000033 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000034 | ..... | ..... | |
| 10,750 | 43,000 | .001400 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001533 | .000066 | ..... | ..... | Elastic limit. |
| 11,750 | 47,000 | .002000 | .000467 | ..... | ..... | |
| 12,000 | 48,000 | .004667 | .002667 | ..... | ..... | |
| 12,250 | 49,000 | .005500 | .000833 | ..... | ..... | |
| 12,500 | 50,000 | .007533 | .002033 | ..... | ..... | |
| 12,750 | 51,000 | .008067 | .000534 | ..... | ..... | |
| 22,180 | 88,720 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,720 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .1933 |
| Elongation per inch under strain at elastic limit | do... | .001533 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".14, ".34, ".10 |

## TUBE.

## No. 6147.

Marks, $\frac{10212}{B\ T_2\ M}\ B_2$
Diameter ".565.
Sectional area. .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000033 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001467 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001533 | .000066 | ..... | ..... | |
| 11,500 | 46,000 | .001600 | .000067 | ..... | ..... | |
| 11,750 | 47,000 | .001667 | .000067 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .002267 | .000600 | ..... | ..... | |
| 12,250 | 49,000 | .003600 | .001333 | ..... | ..... | |
| 12,500 | 50,000 | .005433 | .001833 | ..... | ..... | |
| 12,750 | 51,000 | .006233 | .000800 | ..... | ..... | |
| 13,000 | 52,000 | .007367 | .001134 | ..... | ..... | |
| 21,810 | 87,240 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 87,240 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1966 |
| Elongation per inch under strain at elastic limit | do... | .001667 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 27.6 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | granular, radiating from a serrated spot in the circumference |
| Elongation of inch sections | | ".16, ".15, ".28 |

## TUBE.

No. 6181.

*Marks*, $\frac{12549\ B_1}{B\ T_2\ M}$
*Diameter*, ".564.
*Sectional area*, .25 square inch.
*Gauged length*, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000867 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000200 | .000033 | .000033 | |
| 10,250 | 41,000 | .001400 | .000023 | ..... | ..... | |
| 10,500 | 42,000 | .001433 | .000033 | ..... | ..... | |
| 10,750 | 43,000 | .001467 | .000034 | ..... | ..... | |
| 11,000 | 44,000 | .001500 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001567 | .000067 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .001667 | .000100 | ..... | ..... | |
| 11,750 | 47,000 | .002067 | .000400 | ..... | ..... | |
| 12,000 | 48,000 | .008167 | .001100 | ..... | ..... | |
| 12,250 | 49,000 | .008867 | .000700 | ..... | ..... | |
| 12,500 | 50,000 | .009000 | .001133 | ..... | ..... | |
| 22,590 | 90,360 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,360 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2067 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".358, ".16, ".11 |

## TUBE.

## No. 6182.

Marks, $\frac{12\,M\,R_{ss}\,T}{M\,T_1\,O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000167 | .000100 | ..... | ..... | |
| 5,000 | 20,000 | .000467 | .000300 | ..... | ..... | |
| 7,500 | 30,000 | .000800 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001033 | .000233 | 0. | ..... | |
| 10,000 | 40,000 | .001200 | .000167 | 0. | ..... | |
| 12,750 | 51,000 | .001667 | .000467 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000066 | ..... | ..... | |
| 13,250 | 53,000 | .001800 | .000067 | ..... | ..... | Elastic limit. |
| 13,500 | 54,000 | .002367 | .000567 | ..... | ..... | |
| 13,750 | 55,000 | .004267 | .001900 | ..... | ..... | |
| 14,000 | 56,000 | .005833 | .001566 | ..... | ..... | |
| 14,250 | 57,000 | .007000 | .001167 | ..... | ..... | |
| 14,500 | 58,000 | .008333 | .001333 | ..... | ..... | |
| 22,510 | 90,040 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,040 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch after rupture | inch.. | .2200 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .174 |
| Reduction in area after rupture, per cent of original section | | 52.2 |
| Position of rupture | | ″.95 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ″.14, ″.17, ″.35* |

## TUBE.

## No. 6183.

*Marks,* $\frac{12\ M\ R_{os}\ T}{B\ T_1\ O}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| *Total.* | *Per square inch.* | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000133 | .000083 | .000083 | |
| 10,000 | 40,000 | .001333 | .000200 | .000083 | 0. | |
| 10,250 | 41,000 | .001367 | .000034 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000033 | ..... | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001467 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001500 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001567 | .000067 | ..... | ..... | |
| 11,750 | 47,000 | .001600 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001667 | .000067 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .001933 | .000233 | ..... | ..... | |
| 12,750 | 51,000 | .002167 | .000234 | ..... | ..... | |
| 13,000 | 52,000 | .002633 | .000466 | ..... | ..... | |
| 13,250 | 53,000 | .003333 | .000700 | ..... | ..... | |
| 13,500 | 54,000 | .004733 | .001400 | ..... | ..... | |
| 22,860 | 91,440 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,440 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2233 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .174 |
| Reduction in area after rupture, per cent of original section | | 52.2 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".12, ".40*, ".15 |

## TUBE.

## No. 6194.

Marks, $\frac{12549\ B_2}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000933 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001100 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001267 | .000167 | 0. | ..... | |
| 11,000 | 44,000 | .001400 | .000133 | ..... | ..... | |
| 11,250 | 45,000 | .001433 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001467 | .000034 | ..... | ..... | |
| 11,750 | 47,000 | .001533 | .000066 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .001667 | .000134 | ..... | ..... | |
| 12,250 | 49,000 | .002367 | .000700 | ..... | ..... | |
| 12,500 | 50,000 | .004767 | .002400 | ..... | ..... | |
| 12,750 | 51,000 | .005200 | .000433 | ..... | ..... | |
| 13,000 | 52,000 | .006533 | .001333 | ..... | ..... | |
| 22,370 | 89,480 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,480 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2233 |
| Elongation per inch under strain at elastic limit | do... | .001533 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".12, ".32*, ".23* |

## TUBE.

## No. 6212.

*Marks,* $\frac{12\ M\ R_{2}\ T}{M\ T_{1}\ O}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | ..... | ..... | |
| 10,000 | 40,000 | .001400 | .000233 | .000067 | .000067 | Elastic limit. |
| 10,250 | 41,000 | .001667 | .000267 | ..... | ..... | |
| 10,500 | 42,000 | .001933 | .000266 | ..... | ..... | |
| 10,750 | 43,000 | .002200 | .000267 | ..... | ..... | |
| 11,000 | 44,000 | .002367 | .000167 | ..... | ..... | |
| 11,250 | 45,000 | .004733 | .002366 | ..... | ..... | |
| 20,970 | 83,880 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 83,880 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .2433 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .174 |
| Reduction in area after rupture, per cent of original section | | 52.2 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".13, ".20, ".40* |

## TUBE.

## No. 6218.

Marks, $\frac{12\ M\ R_{as}\ T}{B\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000200 | 0. | ..... | |
| 10,250 | 41,000 | .001367 | .000034 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000033 | ..... | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001500 | .000067 | ..... | ..... | Elastic limit. |
| 11,250 | 45,000 | .001767 | .000267 | ..... | ..... | |
| 11,500 | 46,000 | .005400 | .003633 | ..... | ..... | |
| 11,750 | 47,000 | .008200 | .002800 | ..... | ..... | |
| 12,000 | 48,000 | .008933 | .000733 | ..... | ..... | |
| 12,250 | 49,000 | .009767 | .000834 | ..... | ..... | |
| 20,760 | 83,040 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 83,040 |
| Elastic limit per square inch of original section | do... | 44,000 |
| Elongation per inch after rupture | inch.. | .2333 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .174 |
| Reduction in area after rupture, per cent of original section | | 52.2 |
| Position of rupture | | "1.3 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".13, ".34, ".23 |

## TUBE.

## No. 6230.

Marks, $\frac{13080\ B_1}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | 0. | ..... | |
| 11,000 | 44,000 | .001533 | .000166 | ..... | ..... | |
| 11,250 | 45,000 | .001567 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001633 | .000066 | ..... | ..... | |
| 11,750 | 47,000 | .001667 | .000034 | ..... | ..... | |
| 12,000 | 48,000 | .001733 | .000066 | ..... | ..... | Elastic limit. |
| 12,250 | 49,000 | .004467 | .002734 | ..... | ..... | |
| 12,500 | 50,000 | .005333 | .000866 | ..... | ..... | |
| 12,750 | 51,000 | .005733 | .000400 | ..... | ..... | |
| 13,000 | 52,000 | .007100 | .001367 | ..... | ..... | |
| 13,250 | 53,000 | .007667 | .000567 | ..... | ..... | |
| 22,850 | 91,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,400 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2200 |
| Elongation per inch under strain at elastic limit | do... | .001733 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".7 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".36*, ".14 |

## TUBE.

## No. 6246.

Marks, $\frac{12990\ B_1}{B\ T_5\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | 0. | ..... | |
| 10,250 | 41,000 | .001367 | .000034 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000033 | ..... | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001467 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001533 | .000066 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .001667 | .000134 | ..... | ..... | |
| 11,750 | 47,000 | .005433 | .003766 | ..... | ..... | |
| 12,000 | 48,000 | .006333 | .000900 | ..... | ..... | |
| 12,250 | 49,000 | .007033 | .000700 | ..... | ..... | |
| 12,500 | 50,000 | .008300 | .001267 | ..... | ..... | |
| 21,810 | 87,240 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 87,240 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .001533 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".39*, ".15 |

## TUBE.

## No. 6254.

Marks, $\frac{12\ M\ B_n\ T}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | | | |
| 2,500 | 10,000 | .000267 | .000200 | | | |
| 5,000 | 20,000 | .000600 | .000333 | | | |
| 7,500 | 30,000 | .000933 | .000333 | | | |
| 8,750 | 35,000 | .001067 | .000134 | 0. | | |
| 10,000 | 40,000 | .001267 | .000200 | 0. | | |
| 12,500 | 50,000 | .001600 | .000333 | | | |
| 12,750 | 51,000 | .001633 | .000033 | | | |
| 13,000 | 52,000 | .001667 | .000034 | | | |
| 13,250 | 53,000 | .001700 | .000033 | | | |
| 13,500 | 54,000 | .001733 | .000033 | | | |
| 13,750 | 55,000 | .001767 | .000034 | | | |
| 14,000 | 56,000 | .001800 | .000033 | | | |
| 14,250 | 57,000 | .001833 | .000033 | | | |
| 14,500 | 58,000 | .001867 | .000034 | | | |
| 14,750 | 59,000 | .001933 | .000066 | | | Elastic limit. |
| 15,000 | 60,000 | .008267 | .001334 | | | |
| 15,250 | 61,000 | .006367 | .008100 | | | |
| 15,500 | 62,000 | .007833 | .000966 | | | |
| 15,750 | 63,000 | .008367 | .001034 | | | |
| 16,000 | 64,000 | .009667 | .001300 | | | |
| 24,020 | 96,080 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 96,080 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001933 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".36", ".14, ".13 |

## TUBE.

## No. 6259.

Marks, $\frac{12\ M\ R\ _{78}\ T}{B\ T,\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,750 | 35,000 | .001267 | .000267 | .000067 | .000067 | |
| 10,000 | 40,000 | .001433 | .000166 | .000100 | .000083 | Elastic limit. |
| 10,250 | 41,000 | .001533 | .000100 | ..... | ..... | |
| 10,500 | 42,000 | .001667 | .000134 | ..... | ..... | |
| 10,750 | 43,000 | .002000 | .000333 | ..... | ..... | |
| 11,000 | 44,000 | .003667 | .001667 | ..... | ..... | |
| 11,250 | 45,000 | .004667 | .001000 | ..... | ..... | |
| 11,500 | 46,000 | .006600 | .001933 | ..... | ..... | |
| 20,410 | 81,640 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 81,640 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .001433 |
| Reduction in diameter at point of rupture | do... | .184 |
| Reduction in area after rupture, per cent of original section | | 54.6 |
| Position of rupture | | 1".05 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".12, ".17, ".40 |

## TUBE.

## No. 6261.

Marks, $\frac{12344\ B}{M\ T_5\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | 0. | ..... | |
| 10,000 | 40,000 | .001433 | .000300 | .000067 | .000067 | |
| 10,250 | 41,000 | .001467 | .000034 | ..... | ..... | |
| 10,500 | 42,000 | .001533 | .000066 | ..... | ..... | |
| 10,750 | 43,000 | .001567 | .000034 | ..... | ..... | Elastic limit. |
| 11,000 | 44,000 | .001767 | .000200 | ..... | ..... | |
| 11,250 | 45,000 | .002200 | .000433 | ..... | ..... | |
| 11,500 | 46,000 | .002933 | .000733 | ..... | ..... | |
| 11,750 | 47,000 | .004267 | .001334 | ..... | ..... | |
| 12,000 | 48,000 | .005667 | .001400 | ..... | ..... | |
| 21,780 | 87,120 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 87,120 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".11, ".15, ".37* |

## TUBE.

## No. 6295.

Marks, $\frac{12\ M\ R_{90}\ T}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000167 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000133 | 0. | ..... | |
| 10,250 | 41,000 | .001333 | .000033 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000034 | ..... | ..... | |
| 10,750 | 43,000 | .001400 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001533 | .000066 | ..... | ..... | |
| 11,750 | 47,000 | .001567 | .000034 | ..... | ..... | |
| 12,000 | 48,000 | .001600 | .000033 | ..... | ..... | |
| 12,250 | 49,000 | .001633 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001667 | .000034 | ..... | ..... | |
| 12,750 | 51,000 | .001733 | .000066 | ..... | ..... | Elastic limit. |
| 13,000 | 52,000 | .002333 | .000600 | ..... | ..... | |
| 13,250 | 53,090 | .003000 | .000667 | ..... | ..... | |
| 13,500 | 54,000 | .003000 | .003000 | ..... | ..... | |
| 13,750 | 55,000 | .007333 | .001333 | ..... | ..... | |
| 14,000 | 56,000 | .008333 | .001000 | ..... | ..... | |
| 22,180 | 88,720 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,720 |
| Elastic limit per square inch of original section | do... | 51,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001733 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".11, ".15, ".27 |

## TUBE.

## No. 6300.

Marks, $\frac{12\ M\ R_{a}\ T}{B\ T_{1}\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000933 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001100 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000200 | 0. | ..... | |
| 10,250 | 41,000 | .001333 | .000033 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000034 | ..... | ..... | |
| 10,750 | 43,000 | .001400 | .000033 | ..... | ..... | Elastic limit. |
| 11,000 | 44,000 | .003033 | .001633 | ..... | ..... | |
| 11,250 | 45,000 | .003900 | .000867 | ..... | ..... | |
| 11,500 | 46,000 | .004667 | .000767 | ..... | ..... | |
| 11,750 | 47,000 | .005833 | .001166 | ..... | ..... | |
| 12,000 | 48,000 | .007333 | .001500 | ..... | ..... | |
| 20,410 | 81,640 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 81,640 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".35*, ".17, ".08 |

## TUBE.

## No. 6324.

Marks, $\frac{14182\ B_2}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001083 | .000866 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | 0. | ..... | |
| 10,250 | 41,000 | .001400 | .000033 | ..... | ..... | |
| 10,500 | 42,000 | .001467 | .000067 | ..... | ..... | |
| 10,750 | 43,000 | .001533 | .000066 | ..... | ..... | |
| 11,000 | 44,000 | .001600 | .000067 | ..... | ..... | |
| 11,250 | 45,000 | .001633 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001667 | .000034 | ..... | ..... | |
| 11,750 | 47,000 | .001700 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001733 | .000033 | ..... | ..... | |
| 12,250 | 49,000 | .001767 | .000034 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .004033 | .002266 | ..... | ..... | |
| 12,750 | 51,000 | .007833 | .003800 | ..... | ..... | |
| 13,000 | 52,000 | .008600 | .000767 | ..... | ..... | |
| 13,250 | 53,000 | .009267 | .000667 | ..... | ..... | |
| 13,500 | 54,000 | .010333 | .001066 | ..... | ..... | |
| 22,390 | 89,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,560 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2333 |
| Elongation per inch under strain at elastic limit | do... | .001767 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".37 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".32, ".22 |

## TUBE.

## No. 6352.

*Marks,* $\frac{14561\ B_1}{M\ T,\ M}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000200 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | 0. | ..... | |
| 12,000 | 48,000 | .001633 | .000800 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000067 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .005633 | .003933 | ..... | ..... | |
| 12,750 | 51,000 | .006767 | .001134 | ..... | ..... | |
| 13,000 | 52,000 | .007400 | .000633 | ..... | ..... | |
| 13,250 | 53,000 | .008033 | .000633 | ..... | ..... | |
| 13,500 | 54,000 | .009267 | .001234 | ..... | ..... | |
| 23,100 | 92,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,400 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2200 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".18 ".33* ".15 |

## TUBE.

## No. 6366.

Marks, $\frac{14493\ B_2}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000867 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000200 | .000033 | .000033 | |
| 10,000 | 40,000 | .001367 | .000167 | .000033 | 0. | |
| 11,500 | 46,000 | .001633 | .000266 | ..... | ..... | Elastic limit. |
| 11,750 | 47,000 | .001767 | .000134 | ..... | ..... | |
| 12,000 | 48,000 | .005667 | .003900 | ..... | ..... | |
| 12,250 | 49,000 | .006600 | .000933 | ..... | ..... | |
| 12,500 | 50,000 | .007700 | .001100 | ..... | ..... | |
| 12,750 | 51,000 | .008433 | .000733 | ..... | ..... | |
| 22,030 | 88,120 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,120 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".41*, ".15 |

## JACKET.

## No. 6365.

*Marks,* $\frac{14537\ B.}{M\ T.\ M}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000867 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001467 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001533 | .000066 | ..... | ..... | |
| 11,500 | 46,000 | .001567 | .000034 | ..... | ..... | |
| 11,750 | 47,000 | .001600 | .000033 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .001700 | .000100 | ..... | ..... | |
| 12,250 | 49,000 | .002000 | .000300 | ..... | ..... | |
| 12,500 | 50,000 | .005267 | .003267 | ..... | ..... | |
| 12,750 | 51,000 | .005667 | .000400 | ..... | ..... | |
| 13,000 | 52,000 | .006667 | .001000 | ..... | ..... | |
| 23,910 | 95,640 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,640 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1867 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .094 |
| Reduction in area after rupture, per cent of original section | | 30.6 |
| Position of rupture | | 1.″6 from neck |
| Character of broken surface | | granular 70 per cent, silky 30 per cent |
| Elongation of inch sections | | ″.14, ″.28, ″.14 |

## JACKET.

## No. 6078.

Marks, $\frac{11766\ B_4}{M\ T_1\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000133 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001400 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001500 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001533 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001567 | .000034 | ..... | ..... | |
| 12,250 | 49,000 | .001633 | .000066 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .005733 | .004100 | ..... | ..... | |
| 12,750 | 51,000 | .006500 | .000767 | ..... | ..... | |
| 13,000 | 52,000 | .007333 | .000833 | ..... | ..... | |
| 13,250 | 53,000 | .008000 | .000667 | ..... | ..... | |
| 13,500 | 54,000 | .009100 | .001100 | ..... | ..... | |
| 22,820 | 91,280 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,280 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2067 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | | 41.9 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky 80 per cent, granular, 20 per cent |
| Elongation of inch sections | | ".14, ".22, .".26 |

## JACKET.

## No. 6089.

*Marks,* $\frac{11766\ B_2}{B\ T_2\ M}$
*Diameter,* ".565.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | Elastic limit. |
| 11,000 | 44,000 | .001567 | .000100 | ..... | ..... | |
| 11,250 | 45,000 | .002067 | .000500 | ..... | ..... | |
| 11,500 | 46,000 | .004033 | .001967 | ..... | ..... | |
| 11,750 | 47,000 | .006333 | .002333 | ..... | ..... | |
| 12,000 | 48,000 | .007000 | .000667 | ..... | ..... | |
| 22,310 | 89,240 | ----------- | ----------- | ----------- | ----------- | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,240 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .2233 |
| Elongation per inch under strain at elastic limit | do... | .001433 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".30", ".20, ".17 |

## JACKET.

## No. 6109.

Marks, $\frac{11768\ B_2}{B\ T_6\ M}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000867 | .000234 | ..... | ..... | |
| 5,000 | 20,000 | .000783 | .000366 | ..... | ..... | |
| 7,500 | 30,000 | .001100 | .000367 | ..... | ..... | |
| 8,750 | 35,000 | .001267 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001433 | .000166 | ..... | ..... | |
| 10,500 | 42,000 | .001583 | .000100 | .000033 | .000033 | |
| 10,750 | 43,000 | .001600 | .000067 | ..... | ..... | |
| 11,000 | 44,000 | .001633 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001667 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001733 | .000066 | ..... | ..... | |
| 11,750 | 47,000 | .001800 | .000067 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .002000 | .000200 | ..... | ..... | |
| 12,250 | 49,000 | .003333 | .001333 | ..... | ..... | |
| 12,500 | 50,000 | .005000 | .001667 | ..... | ..... | |
| 12,750 | 51,000 | .005867 | .000867 | ..... | ..... | |
| 13,000 | 52,000 | .006400 | .001033 | ..... | ..... | |
| 23,810 | 95,240 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 95,240 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1983 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".13, ".16, ".29 |

## JACKET.

### No. 6151.

Marks, $\frac{11914\ B.}{M\ T.\ M.}$
Diameter, ".565.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000800 | ..... | ..... | |
| 7,500 | 30,000 | .000833 | .000833 | ..... | ..... | |
| 8,750 | 35,000 | .001100 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000233 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001400 | 0. | ..... | ..... | |
| 11,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001500 | .000033 | ..... | ..... | Elastic limit. |
| 11,750 | 47,000 | .001667 | .000167 | ..... | ..... | |
| 12,000 | 48,000 | .002100 | .000433 | ..... | ..... | |
| 12,250 | 49,000 | .002367 | .000267 | ..... | ..... | |
| 12,500 | 50,000 | .003367 | .001000 | ..... | ..... | |
| 12,750 | 51,000 | .004067 | .000700 | ..... | ..... | |
| 22,940 | 91,760 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,760 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .2033 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 39.2 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | granular; radiating from a silky spot at the circumference |
| Elongation of inch sections | | ".14, ".26*, ".21 |

## JACKET.

## No. 6154.

Marks, $\frac{11497\ B_2}{B\ T_{11}\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,750 | 35,000 | .001233 | .000200 | ..... | ..... | |
| 10,000 | 40,000 | .001400 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001533 | .000133 | 0. | ..... | |
| 10,750 | 43,000 | .001533 | 0. | ..... | ..... | |
| 11,000 | 44,000 | .001567 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001600 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001633 | .000033 | ..... | ..... | Elastic limit. |
| 11,750 | 47,000 | .001867 | .000234 | ..... | ..... | |
| 12,000 | 48,000 | .002167 | .000300 | ..... | ..... | |
| 12,250 | 49,000 | .002867 | .000700 | ..... | ..... | |
| 12,500 | 50,000 | .004500 | .001633 | ..... | ..... | |
| 12,750 | 51,000 | .005100 | .000600 | ..... | ..... | |
| 23,140 | 92,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,560 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .2133 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | ".90 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".32*, ".17, ".15 |

## JACKET.

## No. 6168.

Marks, $\frac{12202\ B_3}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000167 | .000167 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000166 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | .000033 | .000033 | |
| 10,750 | 43,000 | .001467 | .000067 | ..... | ..... | |
| 11,000 | 44,000 | .001533 | .000066 | ..... | ..... | |
| 11,250 | 45,000 | .001567 | .000034 | ..... | ..... | Elastic limit. |
| 11,500 | 46,000 | .002567 | .001000 | ..... | ..... | |
| 11,750 | 47,000 | .004333 | .001766 | ..... | ..... | |
| 12,000 | 48,000 | .005667 | .001334 | ..... | ..... | |
| 12,250 | 49,000 | .006567 | .000900 | ..... | ..... | |
| 12,500 | 50,000 | .007567 | .001000 | ..... | ..... | |
| 12,750 | 51,000 | .008500 | .000933 | ..... | ..... | |
| 21,790 | 87,160 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 87,160 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture | do... | .114 |
| Reduction in area after rupture, per cent of original section | | 36.4 |
| Position of rupture | | ".22 inch from neck |
| Character of broken surface | | fine granular, silky spot at the circumference |
| Elongation of inch sections | | ".25*, ".25, ".13 |

## JACKET.

## No. 6193.

Marks, $\overset{12\,M\,R_{66}\,J}{B\,T_1\,O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000267 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000367 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | .000083 | .000083 | |
| 10,000 | 40,000 | .001333 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | .000083 | 0. | |
| 12,500 | 50,000 | .001733 | .000333 | ..... | ..... | |
| 12,750 | 51,000 | .001767 | .000034 | ..... | ..... | |
| 13,000 | 52,000 | .001800 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001833 | .000033 | ..... | ..... | |
| 13,500 | 54,000 | .001867 | .000034 | ..... | ..... | |
| 13,750 | 55,000 | .001900 | .000033 | ..... | ..... | |
| 14,000 | 56,000 | .001967 | .000067 | ..... | ..... | |
| 14,250 | 57,000 | .002000 | .000033 | ..... | ..... | |
| 14,500 | 58,000 | .002033 | .000033 | ..... | ..... | |
| 14,750 | 59,000 | .002067 | .000034 | ..... | ..... | |
| 15,000 | 60,000 | .002100 | .000033 | ..... | ..... | |
| 15,250 | 61,000 | .002167 | .000067 | ..... | ..... | Elastic limit. |
| 15,500 | 62,000 | .002267 | .000100 | ..... | ..... | |
| 15,750 | 63,000 | .002400 | .000133 | ..... | ..... | |
| 16,000 | 64,000 | .003000 | .000600 | ..... | ..... | |
| 16,250 | 65,000 | .005733 | .002733 | ..... | ..... | |
| 16,500 | 66,000 | .007167 | .001434 | ..... | ..... | |
| 24,120 | 96,480 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 96,480 |
| Elastic limit per square inch of original section | do... | 61,000 |
| Elongation per inch after rupture | inch... | .1867 |
| Elongation per inch under strain at elastic limit | do... | .002167 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".09, ".31, ".16 |

## JACKET.

## No. 6203.

Marks, $\frac{12\ M\ R_{a}\ J.}{M\ T\ O.}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000833 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000033 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44.000 | .001467 | .000034 | ..... | ..... | |
| 11,250 | 45,000 | .001533 | .000066 | ..... | ..... | |
| 11,500 | 46,000 | .001600 | .000067 | ..... | ..... | |
| 11,750 | 47,000 | .001667 | .000067 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .011400 | .009733 | ..... | ..... | |
| 12,250 | 49,000 | .012333 | .000933 | ..... | ..... | |
| 12,500 | 50,000 | .013500 | .001167 | ..... | ..... | |
| 12,750 | 51,000 | .014333 | .000833 | ..... | ..... | |
| 13,000 | 52,000 | .015433 | .001100 | ..... | ..... | |
| 21,140 | 84,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 84,560 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2467 |
| Elongation per inch under strain at elastic limit | do... | .001667 |
| Reduction in diameter at point of rupture | do... | .174 |
| Reduction in area after rupture, per cent of original section | | 52.2 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".40*, ".19, ".15 |

## JACKET.

## No. 6204.

Marks, $\frac{12513\ B_2}{B\ T_1\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000367 | .000234 | ..... | ..... | |
| 5,000 | 20,000 | .000700 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001233 | .000200 | 0. | ..... | |
| 10,000 | 40,000 | .001433 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001500 | .000067 | .000033 | .000033 | |
| 10,750 | 43,000 | .001567 | .000067 | ..... | ..... | |
| 11,000 | 44,000 | .001600 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001633 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001667 | .000034 | ..... | ..... | |
| 11,750 | 47,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .004367 | .002667 | ..... | ..... | |
| 12,250 | 49,000 | .004833 | .000466 | ..... | ..... | |
| 12,500 | 50,000 | .005500 | .000667 | ..... | ..... | |
| 12,750 | 51,000 | .006333 | .000833 | ..... | ..... | |
| 13,000 | 52,000 | .007167 | .000834 | ..... | ..... | |
| 23,620 | 94,480 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,480 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1900 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .124 |
| Reduction in area after rupture, per cent of original section | | 39.2 |
| Position of rupture | | 1.″3 from neck |
| Character of broken surface | | silky, interspersed with granular metal at the circumference |
| Elongation of inch sections | | ″.17, ″.27ª, ″.13 |

## JACKET.

## No. 6210.

*Marks,* $\frac{12\,M\,R_{B}\,J}{B\,T_{1}\,O}$
*Diameter,* ".564.
*Sectional area,* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000200 | .000083 | .000083 | |
| 10,000 | 40,000 | .001367 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001433 | .000066 | .000067 | .000084 | |
| 10,750 | 23,000 | .001500 | .000067 | ..... | ..... | |
| 11,000 | 44,000 | .001567 | .000067 | ..... | ..... | Elastic limit. |
| 11,250 | 45,000 | .006000 | .004433 | ..... | ..... | |
| 11,500 | 46,000 | .010167 | .004167 | ..... | ..... | |
| 11,750 | 47,000 | .011333 | .001166 | ..... | ..... | |
| 12,000 | 48,000 | .012000 | .000667 | ..... | ..... | |
| 12,250 | 49,000 | .012500 | .000500 | ..... | ..... | |
| 21,180 | 84,720 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 84,720 |
| Elastic limit per square inch of original section | do... | 44,000 |
| Elongation per inch after rupture | inch.. | .2367 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".42*, ".14 |

## JACKET.

## No. 6213.

Marks, $\frac{12\ M\ R_{es}\ J}{B\ T_1\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000166 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001400 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001467 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001500 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001533 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001600 | .000067 | ..... | ..... | |
| 12,250 | 49,000 | .001633 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001667 | .000034 | ..... | ..... | |
| 12,750 | 51,000 | .001667 | 0. | ..... | ..... | |
| 13,000 | 52,000 | .001700 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001733 | .000033 | ..... | ..... | |
| 13,500 | 54,000 | .001767 | .000034 | ..... | ..... | |
| 13,750 | 55,000 | .001800 | .000033 | ..... | ..... | |
| 14,000 | 56,000 | .001833 | .000033 | ..... | ..... | |
| 14,250 | 57,000 | .001900 | .000067 | ..... | ..... | |
| 14,500 | 58,000 | .001933 | .000033 | ..... | ..... | |
| 14,750 | 59,000 | .002000 | .000067 | ..... | ..... | Elastic limit. |
| 15,000 | 60,000 | .007833 | .005833 | ..... | ..... | |
| 15,250 | 61,000 | .008333 | .000500 | ..... | ..... | |
| 15,500 | 62,000 | .009100 | .000767 | ..... | ..... | |
| 15,750 | 63,000 | .010100 | .001000 | ..... | ..... | |
| 16,000 | 64,000 | .011667 | .001567 | ..... | ..... | |
| 23,710 | 94,840 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,840 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .2267 |
| Elongation per inch under strain of elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1″.28 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.28, ″.28, ″.12 |

## JACKET.

## No. 6229.

Marks, $\frac{12372\ B_2}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000167 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001100 | .000133 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001333 | .000033 | 0. | ..... | |
| 10,750 | 43,000 | .001367 | .000034 | ..... | ..... | |
| 11,000 | 44,000 | .001400 | .000033 | ..... | ..... | |
| 11,250 | 45,000 | .001433 | .000033 | ..... | ..... | |
| 11,500 | 46,000 | .001467 | .000034 | ..... | ..... | |
| 11,750 | 47,000 | .001500 | .000033 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .001567 | .000067 | ..... | ..... | |
| | | .005000 | .003433 | ..... | ..... | |
| 12,250 | 49,000 | .007333 | .002333 | ..... | ..... | |
| 12,500 | 50,000 | .008700 | .001367 | ..... | ..... | |
| 12,750 | 51,000 | .009667 | .000967 | ..... | ..... | |
| 13,000 | 52,000 | .010333 | .000666 | ..... | ..... | |
| 22,140 | 88,560 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,560 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1983 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".31+, ".16, ".11 |

## JACKET.

## No. 6255.

Marks, $\frac{12\ M\ R_m\ J}{M\ T_1\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3."

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,750 | 35,000 | .001100 | .000133 | 0. | ..... | |
| 10,000 | 40,000 | .001300 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001367 | .000067 | 0. | ..... | |
| 12,500 | 50,000 | .001667 | .000300 | ..... | ..... | |
| 12,750 | 51,000 | .001700 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001733 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001767 | .000034 | ..... | ..... | |
| 13,500 | 54,000 | .001867 | .000100 | ..... | ..... | |
| 13,750 | 55,000 | .001900 | .000033 | ..... | ..... | Elastic limit. |
| 14,000 | 56,000 | .004333 | .002400 | ..... | ..... | |
| 14,250 | 57,000 | .009000 | .004667 | ..... | ..... | |
| 14,500 | 58,000 | .009667 | .000667 | ..... | ..... | |
| 14,750 | 59,000 | .010533 | .000866 | ..... | ..... | |
| 15,000 | 60,000 | .011600 | .001067 | ..... | ..... | |
| 22,880 | 91,520 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,520 |
| Elastic limit per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2933 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | 1".25 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".26, ".28, ".14 |

## JACKET.

## No. 6256.

*Marks,* $\frac{12\ M\ R_{28}\ J}{B\ T,\ O}$
*Diameter,* ".564.
*Sectional area* .25 square inch.
*Gauged length,* 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000700 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001033 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001467 | .000100 | .000083 | .000083 | |
| 12,000 | 48,000 | .001667 | .000200 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000033 | ..... | ..... | |
| 12,500 | 50,000 | .001733 | .000033 | ..... | ..... | |
| 12,750 | 51,000 | .001767 | .000034 | ..... | ..... | |
| 13,000 | 52,000 | .001800 | .000033 | ..... | ..... | |
| 13,250 | 53,000 | .001833 | .000033 | ..... | ..... | Elastic limit. |
| 13,500 | 54,000 | .002067 | .000234 | ..... | ..... | |
| 13,750 | 55,000 | .002367 | .000300 | ..... | ..... | |
| 14,000 | 56,000 | .004500 | .002133 | ..... | ..... | |
| 14,250 | 57,000 | .007933 | .003433 | ..... | ..... | |
| 14,500 | 58,000 | .008667 | .000734 | ..... | ..... | |
| 23,100 | 92,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,400 |
| Elastic limit per square inch of original section | do... | 53,000 |
| Elongation per inch rupture | inch... | .2467 |
| Elongation per inch under strain at elastic limit | do... | .001833 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction of area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".21, ".39, ".14 |

## JACKET.

## No. 6260.

Marks, $\frac{12513\ B_4}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000133 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000200 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 11,500 | 46,000 | .001567 | .000167 | ..... | ..... | |
| 11,750 | 47,000 | .001600 | .000033 | ..... | ..... | |
| 12,000 | 48,000 | .001667 | .000067 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .003767 | .002067 | ..... | ..... | |
| 12,750 | 51,000 | .004700 | .000933 | ..... | ..... | |
| 13,000 | 52,000 | .005633 | .000933 | ..... | ..... | |
| 13,250 | 53,000 | .006067 | .000434 | ..... | ..... | |
| 13,500 | 54,000 | .007367 | .001300 | ..... | ..... | |
| 24,130 | 96,520 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 96,520 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .1908 |
| Elongation per inch under strain at elastic limit | do... | .001704 |
| Reduction in diameter at point of rupture | do... | .143 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".15, ".12, ".31* |

## JACKET.

## No. 6296.

Marks, $\frac{12\ M\ R_{m}J}{B\ T_{1}\ O}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000233 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000800 | ..... | ..... | |
| 7,500 | 30,000 | .000933 | .000233 | ..... | ..... | |
| 8,750 | 35,000 | .001133 | .000200 | 0. | ..... | |
| 10,000 | 40,000 | .001267 | .000134 | ..... | ..... | |
| 10,500 | 42,000 | .001333 | .000066 | 0. | ..... | |
| 12,500 | 50,000 | .001600 | .000267 | ..... | ..... | |
| 12,750 | 51,000 | .001633 | .000033 | ..... | ..... | |
| 13,000 | 52,000 | .001667 | .000034 | ..... | ..... | |
| 13,250 | 53,000 | .001733 | .000066 | ..... | ..... | |
| 13,500 | 54,000 | .001767 | .000034 | ..... | ..... | |
| 13,750 | 55,000 | .001800 | .000033 | ..... | ..... | |
| 14,000 | 56,000 | .001833 | .000033 | ..... | ..... | Elastic limit. |
| 14,250 | 57,000 | .002000 | .000167 | ..... | ..... | |
| 14,500 | 58,000 | .003500 | .001500 | ..... | ..... | |
| 14,750 | 59,000 | .006000 | .002500 | ..... | ..... | |
| 15,000 | 60,000 | .008333 | .002333 | ..... | ..... | |
| 15,250 | 61,000 | .009600 | .001267 | ..... | ..... | |
| 22,600 | 90,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,400 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .2033 |
| Elongation per inch under strain at elastic limit | do... | .001833 |
| Reduction in diameter at point of rupture | do... | .164 |
| Reduction in area after rupture, per cent of original section | | 49.7 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".10, ".15, ".36* |

## JACKET.

## No. 6302.

Marks, $\frac{12\ M\ R_{os}\ J}{B\ T_1\ O}$
Diameter, ".568.
Sectional area, .253 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 258 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,265 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,530 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,060 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,590 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,855 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 10,120 | 40,000 | .001367 | .000167 | ..... | ..... | |
| 10,626 | 42,000 | .001400 | .000033 | 0. | ..... | |
| 12,650 | 50,000 | .001700 | .000300 | ..... | ..... | |
| 12,908 | 51,000 | .001733 | .000033 | ..... | ..... | |
| 13,156 | 52,000 | .001767 | .000034 | ..... | ..... | |
| 13,409 | 53,000 | .001833 | .000066 | ..... | ..... | |
| 13,662 | 54,000 | .001933 | .000100 | ..... | ..... | |
| 13,915 | 55,000 | .001967 | .000034 | ..... | ..... | |
| 14,168 | 56,000 | .002000 | .000033 | ..... | ..... | |
| 14,421 | 57,000 | .002033 | .000033 | ..... | ..... | Elastic limit. |
| 14,674 | 58,000 | .002167 | .000134 | ..... | ..... | |
| 14,927 | 59,000 | .002433 | .000266 | ..... | ..... | |
| 15,180 | 60,000 | .005000 | .002567 | ..... | ..... | |
| 15,433 | 61,000 | .007367 | .002367 | ..... | ..... | |
| 15,686 | 62,000 | .008667 | .001300 | ..... | ..... | |
| 23,920 | 94,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,550 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .2067 |
| Elongation per inch under strain at elastic limit | do... | .002033 |
| Reduction in diameter at point of rupture | do... | .148 |
| Reduction in area after rupture, per cent of original section | | 45.3 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".12, ".34*, ".16 |

## JACKET.

## No. 6323.

Marks, $\frac{12433\ B}{M\ T_c\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001200 | .000200 | 0. | ..... | |
| 10,000 | 40,000 | .001367 | .000167 | ..... | ..... | |
| 10,500 | 42,000 | .001433 | .000066 | .000033 | .000033 | |
| 10,750 | 43,000 | .001467 | .000034 | ..... | ..... | |
| 11,000 | 44,000 | .001533 | .000066 | ..... | ..... | |
| 11,250 | 45,000 | .001567 | .000034 | ..... | ..... | |
| 11,500 | 46,000 | .001633 | .000066 | ..... | ..... | Elastic limit. |
| 11,750 | 47,000 | .001967 | .000334 | ..... | ..... | |
| 12,000 | 48,000 | .004000 | .002033 | ..... | ..... | |
| 12,250 | 49,000 | .007000 | .003000 | ..... | ..... | |
| 12,500 | 50,000 | .007667 | .000667 | ..... | ..... | |
| 12,750 | 51,000 | .008233 | .000566 | ..... | ..... | |
| 22,940 | 91,760 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,760 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .2333 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .154 |
| Reduction in area after rupture, per cent of original section | | 47.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky. Opened crack in surface of stem |
| Elongation of inch sections | | ".20, ".38*, *.12 |

## JACKET.

## No. 6392.

Marks, $\frac{14594\ B_1}{B\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000867 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 12,000 | 48,000 | .001667 | .000267 | ..... | ..... | |
| 12,250 | 49,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 12,500 | 50,000 | .002700 | .001000 | ..... | ..... | |
| 12,750 | 51,000 | .004333 | .001633 | ..... | ..... | |
| 13,000 | 52,000 | .004967 | .000634 | ..... | ..... | |
| 13,250 | 53,000 | .005833 | .000866 | ..... | ..... | |
| 13,500 | 54,000 | .006667 | .001334 | ..... | ..... | |
| 24,790 | 99,160 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 99,160 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .1300 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .124 |
| Reduction in area after rupture, per cent of original section | | 41.9 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | silky. Trace of granulation |
| Elongation of inch sections | | ".12, ".21, ".11 |

## JACKET.

## No. 6404.

Marks, $\frac{11927\ B}{M\ T_2\ M}$
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 5,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 7,500 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,750 | 35,000 | .001167 | .000167 | 0. | ..... | |
| 10,000 | 40,000 | .001333 | .000166 | ..... | ..... | |
| 10,500 | 42,000 | .001400 | .000067 | 0. | ..... | |
| 10,750 | 43,000 | .001433 | .000033 | ..... | ..... | |
| 11,000 | 44,000 | .001500 | .000067 | ..... | ..... | |
| 11,250 | 45,000 | .001567 | .000067 | ..... | ..... | |
| 11,000 | 44,000 | .001600 | .000033 | ..... | ..... | |
| 11,750 | 47,000 | .001633 | .000033 | ..... | ..... | Elastic limit. |
| 12,000 | 48,000 | .002000 | .000367 | ..... | ..... | |
| 12,250 | 49,000 | .002667 | .000367 | ..... | ..... | |
| 12,500 | 50,000 | .003000 | .000333 | ..... | ..... | |
| 12,750 | 51,000 | .004267 | .000667 | ..... | ..... | |
| 13,000 | 52,000 | .006100 | .000833 | ..... | ..... | |
| 23,710 | 94,840 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,840 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2060 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .114 |
| Reduction in area after rupture, per cent of original section | | 86.4 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | silky, 45 per cent, granular, 55 per cent |
| Elongation of inch sections | | ".13, ".27⁸, ."20 |

*TABULATION OF TENSION SPECIMENS FROM 12-INCH B. L. RIFLED MORTARS (STEMS 3″ LONG, ″.564 DIAMETER).*

| No. of test. | Position in gun. | Location of specimens. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation. | Contraction of area. | Appearance of fracture. | Remarks. |
|---|---|---|---|---|---|---|---|---|
| | | | *Pounds.* | *Pounds.* | *Per ct.* | *Per ct.* | | |
| 6090 | Tube ... | Middle . | 47,000 | 94,240 | 15.7 | 27.6 | Granular, radiating from a point in the circumference. | Breech end. |
| 6076 | ....do ... | ....do ... | 47,000 | 90,920 | 21.0 | 44.6 | Silky..... | Do. |
| 6184 | ....do ... | ....do ... | 46,000 | 88,720 | 19.3 | 44.6 | .....do..... | Muzzle end. |
| 6147 | ....do ... | ....do ... | 47,000 | 87,240 | 19.7 | 27.6 | Granular, radiating from a serrated spot in the circumference. | Breech end. |
| 6181 | ....do ... | ....do ... | 45,000 | 90,360 | 20.7 | 47.2 | Silky..... | Do. |
| 6182 | ....do ... | Outside. | 53,000 | 90,040 | 22.0 | 52.2 | Fine silky..... | Muzzle end. |
| 6183 | ....do ... | ....do ... | 49,000 | 91,440 | 22.3 | 52.2 | .....do..... | Breech end. |
| 6194 | ....do ... | Middle . | 47,000 | 89,480 | 22.3 | 44.6 | Silky..... | Muzzle end. |
| 6212 | ....do ... | Outside. | 40,000 | 83,880 | 24.3 | 52.2 | .....do..... | Do. |
| 6218 | ....do ... | ....do ... | 44,000 | 83,040 | 23.3 | 52.2 | .....do..... | Breech end. |
| 6230 | ....do ... | Middle . | 48,000 | 91,400 | 22.0 | 44.6 | .....do..... | Do. |
| 6246 | ....do ... | ....do ... | 45,000 | 87,240 | 23.0 | 47.2 | .....do..... | Do. |
| 6254 | ....do ... | Outside. | 59,000 | 96,080 | 21.0 | 49.7 | Fine silky..... | Muzzle end. |
| 6259 | ....do ... | ....do ... | 40,000 | 81,640 | 23.0 | 54.6 | Silky..... | Breech end. |
| 6261 | ....do ... | Middle . | 43,000 | 87,120 | 21.0 | 47.2 | .....do..... | Muzzle end. |
| 6295 | ....do ... | Outside. | 51,000 | 88,720 | 21.0 | 47.2 | .....do..... | Do. |
| 6300 | ....do ... | ....do ... | 43,000 | 81,640 | 20.0 | 47.2 | .....do..... | Breech end. |
| 6324 | ....do ... | Middle . | 49,000 | 89,560 | 23.3 | 44.6 | .....do..... | Do. |
| 6352 | ....do ... | ....do ... | 49,000 | 92,400 | 22.0 | 44.6 | .....do..... | Muzzle end. |
| 6366 | ....do ... | ....do ... | 46,000 | 88,120 | 24.0 | 49.7 | .....do..... | Breech end. |
| 6365 | Jacket.. | ....do ... | 47,000 | 95,640 | 18.7 | 30.6 | Granular 70 per cent, silky 30 per cent. | Muzzle end. |
| 6078 | ....do ... | ....do ... | 49,000 | 91,280 | 20.7 | 41.9 | Silky 80 per cent, granular 20 per cent. | Do. |
| 6089 | ....do ... | ....do ... | 43,000 | 89,240 | 22.3 | 44.6 | Silky..... | Breech end. |
| 6109 | ....do ... | ....do ... | 47,000 | 95,240 | 19.3 | 44.6 | .....do..... | Do. |
| 6151 | ....do ... | ....do ... | 46,000 | 91,760 | 20.3 | 39.2 | Granular, radiating from a silky spot at circumference. | Muzzle end. |
| 6154 | ....do ... | ....do ... | 46,000 | 92,560 | 21.3 | 44.6 | Silky..... | Breech end. |
| 6168 | ....do ... | ....do ... | 45,000 | 87,160 | 21.0 | 36.4 | Fine granular, silky spot at the circumference. | Do. |
| 6193 | ....do ... | Outside. | 61,000 | 96,480 | 18.7 | 47.2 | Silky..... | Do. |
| 6208 | ....do ... | ....do ... | 47,000 | 84,560 | 24.7 | 52.2 | .....do..... | Muzzle end. |
| 6204 | ....do ... | Middle . | 47,000 | 94,480 | 19.0 | 39.2 | Silky, interspersed with granular metal at the circumference. | Breech end. |
| 6210 | ....do ... | Outside. | 44,000 | 84,720 | 23.7 | 49.7 | Silky..... | Do. |
| 6218 | ....do ... | ....do ... | 59,000 | 94,840 | 22.7 | 47.2 | .....do..... | Do. |
| 6229 | ....do ... | Middle . | 47,000 | 88,560 | 19.3 | 47.2 | .....do..... | Do. |
| 6255 | ....do ... | Outside. | 55,000 | 91,520 | 29.3 | 49.7 | Fine silky..... | Muzzle end. |
| 6256 | ....do ... | ....do ... | 53,000 | 92,400 | 24.7 | 49.7 | .....do..... | Breech end. |
| 6260 | ....do ... | Middle . | 49,000 | 96,520 | 19.3 | 44.6 | Silky..... | Muzzle end. |
| 6296 | ....do ... | Outside. | 56,000 | 90,400 | 20.3 | 49.7 | .....do..... | Breech end. |
| 6302 | ....do ... | ....do ... | 57,000 | 94,550 | 20.7 | 45.3 | .....do..... | Do. |
| 6323 | ....do ... | Middle . | 46,000 | 91,760 | 23.3 | 47.2 | Silky, opened crack in surface of stem. | Muzzle end. |
| 6392 | ....do ... | ....do ... | 49,000 | 99,160 | 18.0 | 41.9 | Silky, trace of granulation. | Breech end. |
| 6404 | ....do ... | ....do ... | 47,000 | 94,840 | 20.0 | 36.4 | Silky 45 per cent, granular 55 per cent. | Muzzle end. |

# 16-INCH STEEL B. L. RIFLE.

## COMPRESSION SPECIMENS FROM TUBE.

## No. 1163.

Sample from breech end of tube.
Length, 4".
Diameter, ".798.
Sectional area, .50 square inch.
Gauged length, 3".

| Applied loads. | | Compression per inch. | Successive compression per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 500 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,500 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 5,000 | 10,000 | .000267 | .000167 | ..... | ..... | |
| 7,500 | 15,000 | .000433 | .000166 | ..... | ..... | |
| 10,000 | 20,000 | .000600 | .000167 | ..... | ..... | |
| 12,500 | 25,000 | .000767 | .000167 | ..... | ..... | |
| 15,000 | 30,000 | .000933 | .000166 | .000083 | .000083 | |
| 20,000 | 40,000 | .001300 | .000367 | .000067 | .000084 | |
| 20,500 | 41,000 | .001383 | .000083 | ..... | ..... | |
| 21,000 | 42,000 | .001367 | .000084 | ..... | ..... | |
| 21,500 | 43,000 | .001400 | .000083 | ..... | ..... | |
| 22,000 | 44,000 | .001433 | .000033 | ..... | ..... | |
| 22,500 | 45,000 | .001433 | 0. | ..... | ..... | |
| 23,000 | 46,000 | .001500 | .000067 | ..... | ..... | |
| 23,500 | 47,000 | .001533 | .000083 | ..... | ..... | |
| 24,000 | 48,000 | .001567 | .000084 | ..... | ..... | |
| 24,500 | 49,000 | .001600 | .000083 | ..... | ..... | |
| 25,000 | 50,000 | .001667 | .000067 | .000100 | .000083 | |
| 25,500 | 51,000 | .001700 | .000083 | ..... | ..... | |
| 26,000 | 52,000 | .001783 | .000083 | ..... | ..... | Elastic limit. |
| 26,500 | 53,000 | .003167 | .001434 | ..... | ..... | |
| 27,000 | 54,000 | .007633 | .004466 | ..... | ..... | |
| 27,500 | 55,000 | .009567 | .001934 | ..... | ..... | |
| 43,400 | 86,800 | ..... | ..... | ..... | ..... | Ultimate strength. |

Failed by triple flexure.

## No. 1164.

Sample from muzzle end of tube.
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

| Applied loads. | | Compression per inch. | Successive compression per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 500 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,500 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 5,000 | 10,000 | .000233 | .000166 | ..... | ..... | |
| 7,500 | 15,000 | .000367 | .000134 | ..... | ..... | |
| 10,000 | 20,000 | .000500 | .000133 | ..... | ..... | |
| 12,500 | 25,000 | .000667 | .000167 | ..... | ..... | |
| 15,000 | 30,000 | .000933 | .000266 | 0. | ..... | |
| 20,000 | 40,000 | .001167 | .000234 | 0. | ..... | |
| 20,500 | 41,000 | .001200 | .000033 | ..... | ..... | |
| 21,000 | 42,000 | .001233 | .000033 | ..... | ..... | |
| 21,500 | 43,000 | .001267 | .000034 | ..... | ..... | |
| 22,000 | 44,000 | .001300 | .000033 | ..... | ..... | |
| 22,500 | 45,000 | .001333 | .000033 | ..... | ..... | |
| 23,000 | 46,000 | .001367 | .000034 | ..... | ..... | |
| 23,500 | 47,000 | .001400 | .000033 | ..... | ..... | |
| 24,000 | 48,000 | .001433 | .000033 | ..... | ..... | |
| 24,500 | 49,000 | .001467 | .000034 | ..... | ..... | |
| 25,000 | 50,000 | .001500 | .000033 | 0. | ..... | |
| 25,500 | 51,000 | .001533 | .000033 | ..... | ..... | |
| 26,000 | 52,000 | .001567 | .000034 | ..... | ..... | |
| 26,500 | 53,000 | .001600 | .000033 | ..... | ..... | |
| 27,000 | 54,000 | .001633 | .000033 | ..... | ..... | |
| 27,500 | 55,000 | .001667 | .000034 | ..... | ..... | |
| 28,000 | 56,000 | .001700 | .000033 | ..... | ..... | |
| 28,500 | 57,000 | .001733 | .000033 | ..... | ..... | |
| 29,000 | 58,000 | .001767 | .000034 | ..... | ..... | Elastic limit. |
| 29,500 | 59,000 | .002800 | .001033 | ..... | ..... | |
| 30,000 | 60,000 | .008900 | .006100 | ..... | ..... | |
| 47,700 | 95,400 | ..... | ..... | ..... | ..... | Tensile strength. |

Failed by triple flexure.

# RIFLE-BARREL STEEL, .30-CALIBER.

No. 6016.

**Marks, A I M.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002400 | .000033 | ..... | ..... | Elastic limit. |
| 14,400 | 72,000 | .003067 | .000667 | ..... | ..... | |
| | | | | | | Load fell. |
| 13,400 | 67,000 | .003233 | .000166 | ..... | ..... | |
| 13,600 | 68,000 | .003600 | .000367 | ..... | ..... | |
| 13,800 | 69,000 | .005667 | .002067 | ..... | ..... | |
| 14,000 | 70,000 | .009500 | .002833 | ..... | ..... | |
| 14,400 | 72,000 | .010767 | .001267 | ..... | ..... | |
| 14,800 | 74,000 | .012000 | .001233 | ..... | ..... | |
| 15,200 | 76,000 | .013567 | .001567 | ..... | ..... | |
| 15,600 | 78,000 | .015000 | .001433 | ..... | ..... | |
| 16,000 | 80,000 | .016667 | .001667 | ..... | ..... | |
| 16,800 | 84,000 | .020000 | .003333 | ..... | ..... | |
| 17,600 | 88,000 | .023167 | .003167 | ..... | ..... | |
| 18,400 | 92,000 | .027433 | .004266 | ..... | ..... | |
| 19,200 | 96,000 | .032033 | .004600 | ..... | ..... | |
| 20,000 | 100,000 | .037000 | .004967 | ..... | ..... | |
| 20,800 | 104,000 | .0433 | .0068 | ..... | ..... | |
| 21,600 | 108,000 | .0533 | .0100 | ..... | ..... | |
| 22,400 | 112,000 | .0667 | .0134 | ..... | ..... | |
| 23,200 | 116,000 | .0900 | .0233 | ..... | ..... | |
| 23,620 | 118,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 118,100 |
| Elastic limit per square inch of original section | do... | 71,000 |
| Elongation per inch after rupture | inch.. | .1733 |
| Elongation per inch under strain at elastic limit | do... | .002400 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | silky, interspersed with fine granulation, cup shaped |
| Elongation of inch sections | | ".11, ".29*, ".12 |

## No. 6017.

Marks, A I M.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | Initial load. |
| 200 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | 0. | ..... | |
| 14,000 | 70,000 | .002400 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002467 | .000067 | ..... | ..... | |
| 14,400 | 72,000 | .002533 | .000066 | ..... | ..... | |
| 14,600 | 73,000 | .002600 | .000067 | ..... | ..... | |
| 14,800 | 74,000 | .002633 | .000033 | ..... | ..... | |
| 15,000 | 75,000 | .002633 | 0. | ..... | ..... | Elastic limit. Load fell. |
| 13,600 | 68,000 | .004000 | .001367 | ..... | ..... | |
| 13,800 | 69,000 | .004833 | .000833 | ..... | ..... | |
| 14,000 | 70,000 | .007167 | .002334 | ..... | ..... | |
| 14,400 | 72,000 | .011733 | .004566 | ..... | ..... | |
| 14,800 | 74,000 | .012533 | .000800 | ..... | ..... | |
| 15,200 | 76,000 | .013667 | .001134 | ..... | ..... | |
| 15,600 | 78,000 | .015067 | .001400 | ..... | ..... | |
| 16,000 | 80,000 | .016767 | .001700 | ..... | ..... | |
| 16,800 | 84,000 | .020633 | .003866 | ..... | ..... | |
| 17,600 | 88,000 | .023433 | .002800 | ..... | ..... | |
| 18,400 | 92,000 | .027700 | .004267 | ..... | ..... | |
| 19,200 | 96,000 | .032000 | .004300 | ..... | ..... | |
| 20,000 | 100,000 | .036667 | .004667 | ..... | ..... | |
| 20,800 | 104,000 | .0433 | .006633 | ..... | ..... | |
| 21,600 | 108,000 | .0533 | .0100 | ..... | ..... | |
| 22,400 | 112,000 | .0633 | .0100 | ..... | ..... | |
| 23,200 | 116,000 | .0900 | .0267 | ..... | ..... | |
| 23,480 | 117,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 117,400 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1900 |
| Elongation per inch under strain at elastic limit | do... | .002633 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, interspersed with fine granulation, cup shaped |
| Elongation of inch sections | | ".12, ".31*, ".14 |

## No. 6018.

**Marks, A I M.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | ..... | ..... | |
| 12,000 | 60,000 | .002067 | .000367 | 0. | ..... | |
| 14,000 | 70,000 | .002400 | .000333 | ..... | ..... | |
| 14,200 | 71,000 | .002433 | .000033 | ..... | ..... | |
| 14,400 | 72,000 | .002467 | .000034 | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 13,200 | 66,000 | .003367 | .000900 | ..... | ..... | |
| 13,400 | 67,000 | .004000 | .000633 | ..... | ..... | |
| 13,600 | 68,000 | .007000 | .003000 | ..... | ..... | |
| 13,800 | 69,000 | .009733 | .002733 | ..... | ..... | |
| 14,000 | 70,000 | .010300 | .000567 | ..... | ..... | |
| 14,400 | 72,000 | .012300 | .002000 | ..... | ..... | |
| 14,800 | 74,000 | .013667 | .001367 | ..... | ..... | |
| 15,200 | 76,000 | .015100 | .001433 | ..... | ..... | |
| 15,600 | 78,000 | .016667 | .001567 | ..... | ..... | |
| 16,000 | 80,000 | .018333 | .001666 | ..... | ..... | |
| 16,800 | 84,000 | .021433 | .003100 | ..... | ..... | |
| 17,600 | 88,000 | .024967 | .003534 | ..... | ..... | |
| 18,400 | 92,000 | .029367 | .004400 | ..... | ..... | |
| 19,200 | 96,000 | .034000 | .004633 | ..... | ..... | |
| 20,000 | 100,000 | .039333 | .005333 | ..... | ..... | |
| 20,800 | 104,000 | .0467 | .007367 | ..... | ..... | |
| 21,600 | 108,000 | .0567 | .0100 | ..... | ..... | |
| 22,400 | 112,000 | .0700 | .0133 | ..... | ..... | |
| 23,140 | 115,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 115,700 |
| Elastic limit per square inch of original section | do... | 72,000 |
| Elongation per inch after rupture | inch.. | .1833 |
| Elongation per inch under strain at elastic limit | do... | .002467 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.8 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | $^{0}$.12, $^{0}$.82*, $^{0}$.11 |

## No. 6019.

Marks, A I E.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | 0. | ..... | |
| 14,000 | 70,000 | .002433 | .000400 | ..... | ..... | |
| 15,000 | 75,000 | .002633 | .000200 | ..... | ..... | |
| 15,200 | 76,000 | .002667 | .000034 | ..... | ..... | |
| 15,400 | 77,000 | .002700 | .000033 | ..... | ..... | Elastic limit. |
| 15,600 | 78,000 | .003600 | .000900 | ..... | ..... | |
| | | | | | | Load fell. |
| 14,000 | 70,000 | .003900 | .000300 | ..... | ..... | |
| 14,200 | 71,000 | .004333 | .000433 | ..... | ..... | |
| 14,400 | 72,000 | .007000 | .002667 | ..... | ..... | |
| 14,600 | 73,000 | .010667 | .003667 | ..... | ..... | |
| 14,800 | 74,000 | .012433 | .001766 | ..... | ..... | |
| 15,200 | 76,000 | .013167 | .000734 | ..... | ..... | |
| 15,600 | 78,000 | .014333 | .001166 | ..... | ..... | |
| 16,000 | 80,000 | .016000 | .001667 | ..... | ..... | |
| 16,400 | 82,000 | .017600 | .001600 | ..... | ..... | |
| 16,800 | 84,000 | .019367 | .001767 | ..... | ..... | |
| 17,600 | 88,000 | .023000 | .003633 | ..... | ..... | |
| 18,400 | 92,000 | .026567 | .003567 | ..... | ..... | |
| 19,200 | 96,000 | .031100 | .004533 | ..... | ..... | |
| 20,000 | 100,000 | .036667 | .005567 | ..... | ..... | |
| 20,800 | 104,000 | .0433 | .006633 | ..... | ..... | |
| 21,600 | 108,000 | .0533 | .0100 | ..... | ..... | |
| 22,400 | 112,000 | .0600 | .0067 | ..... | ..... | |
| 23,200 | 116,000 | .0767 | .0167 | ..... | ..... | |
| 23,760 | 118,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 118,800 |
| Elastic limit per square inch of original section | do... | 77,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .002700 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky, interspersed with fine granulation cup shaped |
| Elongation of inch sections | | ".25, ".18, ".10 |

## No. 6020.

**Marks, A I E.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | 0. | ..... | |
| 14,000 | 70,000 | .002400 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002433 | .000033 | ..... | ..... | |
| 14,400 | 72,000 | .002467 | .000034 | ..... | ..... | Elastic limit. Load fell. |
| 13,600 | 68,000 | .003633 | .001166 | ..... | ..... | |
| 13,800 | 69,000 | .005167 | .001534 | ..... | ..... | |
| 14,000 | 70,000 | .009600 | .004433 | ..... | ..... | |
| 14,200 | 71,000 | .010033 | .000433 | ..... | ..... | |
| 14,400 | 72,000 | .010667 | .000634 | ..... | ..... | |
| 14,800 | 74,000 | .012033 | .001366 | ..... | ..... | |
| 15,200 | 76,000 | .013433 | .001400 | ..... | ..... | |
| 15,600 | 78,000 | .015000 | .001567 | ..... | ..... | |
| 16,000 | 80,000 | .016500 | .001500 | ..... | ..... | |
| 16,800 | 84,000 | .019667 | .003167 | ..... | ..... | |
| 17,600 | 88,000 | .023267 | .003600 | ..... | ..... | |
| 18,400 | 92,000 | .026667 | .003400 | ..... | ..... | |
| 19,200 | 96,000 | .031667 | .005000 | ..... | ..... | |
| 20,000 | 100,000 | .035833 | .004166 | ..... | ..... | |
| 20,800 | 104,000 | .0433 | .007467 | ..... | ..... | |
| 21,600 | 108,000 | .0500 | .0067 | ..... | ..... | |
| 22,400 | 112,000 | .0567 | .0067 | ..... | ..... | |
| 23,200 | 116,000 | .0833 | .0266 | ..... | ..... | |
| 23,580 | 117,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 117,900 |
| Elastic limit per square inch of original section | do... | 72,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .002467 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | silky, interspersed with fine granulation, cup shaped |
| Elongation of inch sections | | ".12, ".28*, ".13 |

## No. 6021.

Marks, A. I. E.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 14,000 | 70,000 | .002400 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002467 | .000067 | ..... | ..... | Elastic limit. |
| 14,400 | 72,000 | .002567 | .000100 | ..... | ..... | |
| | | .003333 | .000766 | ..... | ..... | Load fell. |
| 13,000 | 65,000 | .003467 | .000134 | ..... | ..... | |
| 13,200 | 66,000 | .003733 | .000266 | ..... | ..... | |
| 13,400 | 67,000 | .006667 | .002934 | ..... | ..... | |
| 13,600 | 68,000 | .010400 | .003733 | ..... | ..... | |
| 13,800 | 69,000 | .011033 | .000633 | ..... | ..... | |
| 14,000 | 70,000 | .011633 | .000600 | ..... | ..... | |
| 14,400 | 72,000 | .013067 | .001434 | ..... | ..... | |
| 14,800 | 74,000 | .015000 | .001933 | ..... | ..... | |
| 15,200 | 76,000 | .016333 | .001333 | ..... | ..... | |
| 15,600 | 78,000 | .017833 | .001500 | ..... | ..... | |
| 16,000 | 80,000 | .019667 | .001834 | ..... | ..... | |
| 16,800 | 84,000 | .023333 | .003666 | ..... | ..... | |
| 17,600 | 88,000 | .027700 | .004367 | ..... | ..... | |
| 18,400 | 92,000 | .031767 | .004067 | ..... | ..... | |
| 19,200 | 96,000 | .037167 | .005400 | ..... | ..... | |
| 20,000 | 100,000 | .043667 | .006500 | ..... | ..... | |
| 20,800 | 104,000 | .0533 | .009633 | ..... | ..... | |
| 21,600 | 108,000 | .0667 | .0134 | ..... | ..... | |
| 22,400 | 112,000 | .0900 | .0233 | ..... | ..... | |
| 22,610 | 113,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 113,050 |
| Elastic limit per square inch of original section | do... | 71,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002467 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine, silky, cup shaped |
| Elongation of inch sections | | .14, .34, .12 |

## No. 6068.

**Marks, A.**
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000334 | 0. | ..... | |
| 10,000 | 50,000 | .001733 | .000366 | ..... | ..... | |
| 12,000 | 60,000 | .002167 | .000434 | ..... | ..... | |
| 13,200 | 66,000 | .002400 | .000233 | ..... | ..... | |
| 13,400 | 67,000 | .002467 | .000067 | ..... | ..... | Elastic limit. |
| 13,600 | 68,000 | .010333 | .007866 | ..... | ..... | |
| 13,800 | 69,000 | .014667 | .004334 | ..... | ..... | |
| 14,000 | 70,000 | .019500 | .004833 | ..... | ..... | |
| 14,200 | 71,000 | .021233 | .001733 | ..... | ..... | |
| 14,400 | 72,000 | .022167 | .000934 | ..... | ..... | |
| 14,800 | 74,000 | .023833 | .001666 | ..... | ..... | |
| 15,200 | 76,000 | .026000 | .002167 | ..... | ..... | |
| 15,600 | 78,000 | .028433 | .002433 | ..... | ..... | |
| 16,000 | 80,000 | .031000 | .002567 | ..... | ..... | |
| 16,800 | 84,000 | .036667 | .005667 | ..... | ..... | |
| 17,600 | 88,000 | .042833 | .006166 | ..... | ..... | |
| 18,400 | 92,000 | .0533 | .010467 | ..... | ..... | |
| 19,200 | 96,000 | .0667 | .0134 | ..... | ..... | |
| 20,000 | 100,000 | .0867 | .0200 | ..... | ..... | |
| 20,780 | 103,900 | .1600 | .0733 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 103,900 |
| Elastic limit per square inch of original section | do... | 67,000 |
| Elongation per inch after rupture | inch.. | .2233 |
| Elongation per inch under strain at elastic limit | do... | .002467 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".25 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".25*, ".29*, ".13 |

## No. 6069.

Marks, A.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 13,000 | 65,000 | .002267 | .000234 | ..... | ..... | |
| 13,200 | 66,000 | .002300 | .000033 | ..... | ..... | |
| 13,400 | 67,000 | .002333 | .000033 | ..... | ..... | |
| 13,600 | 68,000 | .002333 | 0. | ..... | ..... | |
| 13,800 | 69,000 | .002367 | .000034 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .002467 | .000100 | ..... | ..... | |
| | | | | | | Load fell. |
| 13,600 | 68,000 | .003400 | .000933 | ..... | ..... | |
| 13,800 | 69,000 | .004000 | .000600 | ..... | ..... | |
| 14,000 | 70,000 | .005333 | .001333 | ..... | ..... | |
| 14,200 | 71,000 | .006167 | .000834 | ..... | ..... | |
| 14,400 | 72,000 | .008333 | .002166 | ..... | ..... | |
| 14,800 | 74,000 | .010333 | .002000 | ..... | ..... | |
| 15,200 | 76,000 | .014167 | .003834 | ..... | ..... | |
| 15,600 | 78,000 | .017333 | .003166 | ..... | ..... | |
| 16,000 | 80,000 | .019333 | .002000 | ..... | ..... | |
| 16,800 | 84,000 | .023167 | .003834 | ..... | ..... | |
| 17,600 | 88,000 | .027333 | .004166 | ..... | ..... | |
| 18,400 | 92,000 | .0333 | .005967 | ..... | ..... | |
| 19,200 | 96,000 | .0367 | .003400 | ..... | ..... | |
| 20,000 | 100,000 | .0433 | .0066 | ..... | ..... | |
| 20,800 | 104,000 | .0533 | .0100 | ..... | ..... | |
| 21,600 | 108,000 | .0633 | .0100 | ..... | ..... | |
| 22,400 | 112,000 | .0833 | .0200 | ..... | ..... | |
| 22,810 | 114,050 | .1100 | .0267 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 114,050 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .002367 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | ″.9 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ″.30, ″.13, ″.10 |

## No. 6070.

Marks, A.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 13,000 | 65,000 | .002267 | .000234 | ..... | ..... | |
| 13,200 | 66,000 | .002300 | .000033 | ..... | ..... | |
| 13,400 | 67,000 | .002333 | .000033 | ..... | ..... | |
| 13,600 | 68,000 | .002367 | .000034 | ..... | ..... | |
| 13,800 | 69,000 | .002400 | .000033 | ..... | ..... | |
| 14,000 | 70,000 | .002433 | .000033 | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 13,000 | 65,000 | .003300 | .000867 | ..... | ..... | |
| 13,200 | 66,000 | .006333 | .003033 | ..... | ..... | |
| 13,400 | 67,000 | .016500 | .000167 | ..... | ..... | |
| 13,600 | 68,000 | .017267 | .000767 | ..... | ..... | |
| 13,800 | 69,000 | .017500 | .000233 | ..... | ..... | |
| 14,000 | 70,000 | .017933 | .000433 | ..... | ..... | |
| 14,200 | 71,000 | .018400 | .000467 | ..... | ..... | |
| 14,400 | 72,000 | .019333 | .000933 | ..... | ..... | |
| 14,800 | 74,000 | .021000 | .001667 | ..... | ..... | |
| 15,200 | 76,000 | .023000 | .002000 | ..... | ..... | |
| 15,600 | 78,000 | .025000 | .002000 | ..... | ..... | |
| 16,000 | 80,000 | .027167 | .002167 | ..... | ..... | |
| 16,800 | 84,000 | .031667 | .004500 | ..... | ..... | |
| 17,600 | 88,000 | .037333 | .005666 | ..... | ..... | |
| 18,400 | 92,000 | .0467 | .009367 | ..... | ..... | |
| 19,200 | 96,000 | .0533 | .0066 | ..... | ..... | |
| 20,000 | 100,000 | .0667 | .0134 | ..... | ..... | |
| 20,800 | 104,000 | .0867 | .0200 | ..... | ..... | |
| 21,390 | 106,950 | .1433 | .0566 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 106,950 |
| Elastic limit per square inch of original section | do... | 70,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002433 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.8 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".12, ".34, ".14 |

## MADE FROM BAR.

## No. 6096.

Marks, 78.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000334 | ..... | ..... | |
| 10,000 | 50,000 | .001733 | .000366 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000334 | ..... | ..... | |
| 13,000 | 65,000 | .002267 | .000200 | ..... | ..... | |
| 13,200 | 66,000 | .002300 | .000033 | ..... | ..... | |
| 13,400 | 67,000 | .002333 | .000033 | ..... | ..... | |
| 13,600 | 68,000 | .002367 | .000034 | ..... | ..... | |
| 13,800 | 69,000 | .002400 | .000033 | ..... | ..... | |
| 14,000 | 70,000 | .002433 | .000033 | ..... | ..... | |
| 14,200 | 71,000 | .002467 | .000034 | ..... | ..... | |
| 14,400 | 72,000 | .002500 | .000033 | ..... | ..... | |
| 14,600 | 73,000 | .002567 | .000067 | ..... | ..... | |
| 14,800 | 74,000 | .002600 | .000033 | ..... | ..... | |
| 15,000 | 75,000 | .002633 | .000033 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .011233 | .008600 | ..... | ..... | |
| 15,400 | 77,000 | .011400 | .000167 | ..... | ..... | |
| 15,600 | 78,000 | .011900 | .000500 | ..... | ..... | |
| 15,800 | 79,000 | .012333 | .000433 | ..... | ..... | |
| 16,000 | 80,000 | .013033 | .000700 | ..... | ..... | |
| 16,400 | 82,000 | .014300 | .001267 | ..... | ..... | |
| 16,800 | 84,000 | .015833 | .001533 | ..... | ..... | |
| 17,600 | 88,000 | .019067 | .003234 | ..... | ..... | |
| 18,400 | 92,000 | .022833 | .003766 | ..... | ..... | |
| 19,200 | 96,000 | .026600 | .003767 | ..... | ..... | |
| 20,000 | 100,000 | .030267 | .003667 | ..... | ..... | |
| 20,800 | 104,000 | .034667 | .004400 | ..... | ..... | |
| 21,600 | 108,000 | .040333 | .005666 | ..... | ..... | |
| 22,400 | 112,000 | .0500 | .009667 | ..... | ..... | |
| 23,200 | 116,000 | .0600 | .0100 | ..... | ..... | |
| 24,000 | 120,000 | .0767 | .0167 | ..... | ..... | |
| 24,610 | 123,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 123,050 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .002633 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | fine granular, radiating from the center |
| Elongation of inch sections | | ".10, ".13, ".22 |

## From Butt of Barrels, Heated in New Furnace and Rolled.

### No. 6097.

Marks, 78.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 10,000 | 50,000 | .001733 | .000366 | ..... | ..... | |
| 12,000 | 60,000 | .002100 | .000367 | ..... | ..... | |
| 12,200 | 61,000 | .002167 | .000067 | ..... | ..... | |
| 12,400 | 62,000 | .002233 | .000066 | ..... | ..... | |
| 12,600 | 63,000 | .002267 | .000034 | ..... | ..... | |
| 12,800 | 64,000 | .002333 | .000066 | ..... | ..... | Elastic limit. |
| 13,000 | 65,000 | .008500 | .006167 | ..... | ..... | |
| 13,200 | 66,000 | .009000 | .000500 | ..... | ..... | |
| 13,400 | 67,000 | .009700 | .000700 | ..... | ..... | |
| 13,600 | 68,000 | .010067 | .000367 | ..... | ..... | |
| 13,800 | 69,000 | .010667 | .000600 | ..... | ..... | |
| 14,000 | 70,000 | .011333 | .000666 | ..... | ..... | |
| 14,400 | 72,000 | .012700 | .001367 | ..... | ..... | |
| 14,800 | 74,000 | .014000 | .001300 | ..... | ..... | |
| 15,200 | 76,000 | .015667 | .001667 | ..... | ..... | |
| 15,600 | 78,000 | .017000 | .001333 | ..... | ..... | |
| 16,000 | 80,000 | .018700 | .001700 | ..... | ..... | |
| 16,800 | 84,000 | .022000 | .003300 | ..... | ..... | |
| 17,600 | 88,000 | .025400 | .003400 | ..... | ..... | |
| 18,400 | 92,000 | .029067 | .003567 | ..... | ..... | |
| 19,200 | 96,000 | .033700 | .004733 | ..... | ..... | |
| 20,000 | 100,000 | .039000 | .005300 | ..... | ..... | |
| 20,800 | 104,000 | .0467 | .0077 | ..... | ..... | |
| 21,600 | 108,000 | .0567 | .0100 | ..... | ..... | |
| 22,400 | 112,000 | .0667 | .0100 | ..... | ..... | |
| 23,200 | 116,000 | .1167 | .0500 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 116,000 |
| Elastic limit per square inch of original section | do... | 64,000 |
| Elongation per inch after rupture | inch.. | .1400 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | silky, interspersed with fine granulation, radiating from the center |
| Elongation of inch sections | | ".23*, ".11, ".08 |

## No. 6098.

Marks, 78 .
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 12,200 | 61,000 | .002100 | .000067 | ..... | ..... | |
| 12,400 | 62,000 | .002167 | .000067 | ..... | ..... | |
| 12,600 | 63,000 | .002233 | .000066 | ..... | ..... | |
| 12,800 | 64,000 | .002267 | .000034 | ..... | ..... | |
| 13,000 | 65,000 | .002333 | .000066 | ..... | ..... | |
| 13,200 | 66,000 | .002333 | 0. | ..... | ..... | Elastic limit. |
| 13,400 | 67,000 | .009667 | .007334 | ..... | ..... | |
| 13,600 | 68,000 | .010600 | .000933 | ..... | ..... | |
| 13,800 | 69,000 | .011200 | .000600 | ..... | ..... | |
| 14,000 | 70,000 | .011667 | .000467 | ..... | ..... | |
| 14,400 | 72,000 | .012833 | .001166 | ..... | ..... | |
| 14,800 | 74,000 | .014167 | .001334 | ..... | ..... | |
| 15,200 | 76,000 | .016500 | .002333 | ..... | ..... | |
| 15,600 | 78,000 | .017467 | .000967 | ..... | ..... | |
| 16,000 | 80,000 | .018833 | .001366 | ..... | ..... | |
| 16,800 | 84,000 | .022733 | .003900 | ..... | ..... | |
| 17,600 | 88,000 | .026667 | .003934 | ..... | ..... | |
| 18,400 | 92,000 | .030667 | .004000 | ..... | ..... | |
| 19,200 | 96,000 | .035667 | .005000 | ..... | ..... | |
| 20,000 | 100,000 | .041333 | .005666 | ..... | ..... | |
| 20,800 | 104,000 | .0500 | .008667 | ..... | ..... | |
| 21,600 | 108,000 | .0633 | .0133 | ..... | ..... | |
| 22,400 | 112,000 | .0833 | .0200 | ..... | ..... | |
| 22,820 | 114,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 114,100 |
| Elastic limit per square inch of original section | do... | 66,000 |
| Elongation per inch after rupture | inch.. | .1333 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | silky, interspersed with fine granulation |
| Elongation of inch sections | | ".21*, ".12, ".07 |

## No. 6099.

Marks, B ✠ R.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000933 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002300 | .000333 | ..... | ..... | |
| 16,000 | 80,000 | .002633 | .000333 | ..... | ..... | |
| 18,000 | 90,000 | .003000 | .000367 | ..... | ..... | |
| 20,000 | 100,000 | .003333 | .000333 | ..... | ..... | |
| 20,200 | 101,000 | .003367 | .000034 | ..... | ..... | Elastic limit. |
| 20,400 | 102,000 | .025100 | .021733 | ..... | ..... | |
| 20,600 | 103,000 | .026067 | .000967 | ..... | ..... | |
| 20,800 | 104,000 | .026933 | .000866 | ..... | ..... | |
| 21,200 | 106,000 | .029333 | .002400 | ..... | ..... | |
| 21,600 | 108,000 | .031833 | .002500 | ..... | ..... | |
| 22,000 | 110,000 | .034500 | .002667 | ..... | ..... | |
| 22,400 | 112,000 | .037333 | .002833 | ..... | ..... | |
| 23,200 | 116,000 | .0467 | .009367 | ..... | ..... | |
| 24,000 | 120,000 | .0600 | .0133 | ..... | ..... | |
| 24,800 | 124,000 | .0833 | .0233 | ..... | ..... | |
| 25,110 | 125,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 125,550 |
| Elastic limit per square inch of original section | do... | 101,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .003367 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | 1″.21 from neck |
| Character of broken surface | | fine silky, cup-shaped, serrated surface |
| Elongation of inch sections | | ″.09, ″.19*, ″.21* |

## No. 6100.

Marks, B ✠ R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000333 | ..... | ..... | |
| 16,000 | 80,000 | .002667 | .000334 | ..... | ..... | |
| 18,000 | 90,000 | .003000 | .000333 | ..... | ..... | |
| 20,000 | 100,000 | .003333 | .000333 | ..... | ..... | |
| 20,200 | 101,000 | .003367 | .000034 | ..... | ..... | |
| 20,400 | 102,000 | .003400 | .000033 | ..... | ..... | |
| 20,600 | 103,000 | .003433 | .000033 | ..... | ..... | Elastic limit. |
| 20,800 | 104,000 | .004500 | .001067 | ..... | ..... | |
| | | | | | | Load fell. |
| 19,200 | 96,000 | .005033 | .000533 | ..... | ..... | |
| 19,400 | 97,000 | .010700 | .005667 | ..... | ..... | |
| 19,600 | 98,000 | .013667 | .002967 | ..... | ..... | |
| 19,800 | 99,000 | .020000 | .006333 | ..... | ..... | |
| 20,000 | 100,000 | .020600 | .000600 | ..... | ..... | |
| 20,200 | 101,000 | .021100 | .000500 | ..... | ..... | |
| 20,400 | 102,000 | .021600 | .000500 | ..... | ..... | |
| 20,600 | 103,000 | .022667 | .001067 | ..... | ..... | |
| 20,800 | 104,000 | .023333 | .000666 | ..... | ..... | |
| 21,200 | 106,000 | .025667 | .002334 | ..... | ..... | |
| 21,600 | 108,000 | .027667 | .002000 | ..... | ..... | |
| 22,000 | 110,000 | .030000 | .002333 | ..... | ..... | |
| 22,400 | 112,000 | .034000 | .004000 | ..... | ..... | |
| 23,200 | 116,000 | .040000 | .006000 | ..... | ..... | |
| 24,000 | 120,000 | .0500 | .0100 | ..... | ..... | |
| 24,800 | 124,000 | .0633 | .0133 | ..... | ..... | |
| 25,460 | 127,300 | .1033 | .0400 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 127,300 |
| Elastic limit per square inch of original section | do... | 103,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .003433 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | fine silky, cup-shaped |
| Elongation of inch sections | | ".07, ".11, ".27* |

## No. 6101.

*Marks, B ✠ R.*
*Diameter, ".505.*
*Sectional area, .20 square inch.*
*Gauged length, 3".*

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000333 | ..... | ..... | |
| 16,000 | 80,000 | .002667 | .000334 | ..... | ..... | |
| 18,000 | 90,000 | .003000 | .000333 | ..... | ..... | |
| 20,000 | 100,000 | .003367 | .000367 | ..... | ..... | |
| *21,200* | *101,000* | .003400 | .000033 | ..... | ..... | |
| *21,400* | *102,000* | .003433 | .000033 | ..... | ..... | |
| *21,600* | *103,000* | .003467 | .000034 | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 19,200 | 96,000 | .004533 | .001066 | ..... | ..... | |
| 19,400 | 97,000 | .005333 | .000800 | ..... | ..... | |
| 19,600 | 98,000 | .010667 | .005334 | ..... | ..... | |
| 19,800 | 99,000 | .012667 | .002000 | ..... | ..... | |
| 20,000 | 100,000 | .023467 | .010800 | ..... | ..... | |
| 20,200 | 101,000 | .024167 | .000700 | ..... | ..... | |
| 20,400 | 102,000 | .024500 | .000333 | ..... | ..... | |
| 20,800 | 104,000 | .025267 | .000767 | ..... | ..... | |
| 21,200 | 106,000 | .027000 | .001733 | ..... | ..... | |
| 21,600 | 108,000 | .029633 | .002633 | ..... | ..... | |
| 22,400 | 112,000 | .036600 | .006967 | ..... | ..... | |
| 23,200 | 116,000 | .042667 | .006067 | ..... | ..... | |
| 24,000 | 120,000 | .052333 | .009666 | ..... | ..... | |
| 24,800 | 124,000 | .0700 | .017667 | ..... | ..... | |
| 25,270 | 126,350 | .1033 | .0333 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 126,350 |
| Elastic limit per square inch of original section | do... | 103,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .008467 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 87.1 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".09, ".10, ".26* |

## No. 6102.

Marks, B ✠ W.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | ..... | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002300 | .000333 | ..... | ..... | |
| 16,000 | 80,000 | .002633 | .000333 | ..... | ..... | |
| 17,200 | 86,000 | .002800 | .000167 | ..... | ..... | |
| 17,400 | 87,000 | .002833 | .000033 | ..... | ..... | Elastic limit. Load fell. |
| 16,400 | 82,000 | .004333 | .001500 | ..... | ..... | |
| 16,600 | 83,000 | .014167 | .009834 | ..... | ..... | |
| 16,800 | 84,000 | .019000 | .004833 | ..... | ..... | |
| 17,000 | 85,000 | .020000 | .001000 | ..... | ..... | |
| 17,200 | 86,000 | .020567 | .000567 | ..... | ..... | |
| 17,600 | 88,000 | .021833 | .001266 | ..... | ..... | |
| 18,000 | 90,000 | .025333 | .003500 | ..... | ..... | |
| 19,200 | 96,000 | .032500 | .007167 | ..... | ..... | |
| 20,000 | 100,000 | .042667 | .010167 | ..... | ..... | |
| 20,800 | 104,000 | .052667 | .010000 | ..... | ..... | |
| 21,600 | 108,000 | .0767 | .024033 | ..... | ..... | |
| 22,210 | 111,050 | .1200 | .0433 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 111,050 |
| Elastic limit per square inch of original section | do... | 87,000 |
| Elongation per inch after rupture | inch.. | .1867 |
| Elongation per inch under strain at elastic limit | do... | .002833 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".07 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".29, ".16, ".11 |

## No. 6103.

Marks, B ✠ W.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000300 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000333 | ..... | ..... | |
| 16,000 | 80,000 | .002700 | .000367 | ..... | ..... | |
| 17,000 | 85,000 | .002867 | .000167 | ..... | ..... | |
| 17,200 | 86,000 | .002900 | .000033 | ..... | ..... | |
| 17,400 | 87,000 | .002933 | .000033 | ..... | ..... | Elastic limit. Load fell. |
| 16,200 | 81,000 | .004267 | .001334 | ..... | ..... | |
| 16,400 | 82,000 | .010000 | .005733 | ..... | ..... | |
| 16,600 | 83,000 | .016000 | .006000 | ..... | ..... | |
| 16,800 | 84,000 | .016667 | .000667 | ..... | ..... | |
| 17,000 | 85,000 | .017267 | .000600 | ..... | ..... | |
| 17,200 | 86,000 | .018000 | .000733 | ..... | ..... | |
| 17,600 | 88,000 | .020000 | .002000 | ..... | ..... | |
| 18,000 | 90,000 | .022500 | .002500 | ..... | ..... | |
| 18,400 | 92,000 | .024667 | .002167 | ..... | ..... | |
| 19,200 | 96,000 | .031400 | .006733 | ..... | ..... | |
| 20,000 | 100,000 | .038833 | .007433 | ..... | ..... | |
| 20,800 | 104,000 | .045000 | .006167 | ..... | ..... | |
| 21,600 | 108,000 | .0633 | .0183 | ..... | ..... | |
| 22,400 | 112,000 | .0933 | .0300 | ..... | ..... | |
| 22,510 | 112,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,550 |
| Elastic limit per square inch of original section | do... | 87,000 |
| Elongation per inch after rupture | inch.. | .1733 |
| Elongation per inch under strain at elastic limit | do.... | .002933 |
| Reduction in diameter at point of rupture | do.... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1″.4 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ″.10, ″.29 +, ″.13 |

## No. 6104.

Marks, B ✠ W.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3"

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000833 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000367 | ..... | ..... | |
| 16,000 | 80,000 | .002700 | .000333 | ..... | ..... | |
| 17,000 | 85,000 | .002900 | .000200 | ..... | ..... | Elastic limit.<br>Load fell. |
| 16,400 | 82,000 | .004333 | .001433 | ..... | ..... | |
| 16,600 | 83,000 | .005500 | .001167 | ..... | ..... | |
| 16,800 | 84,000 | .012333 | .006833 | ..... | ..... | |
| 17,200 | 86,000 | .020667 | .008234 | ..... | ..... | |
| 17,600 | 88,000 | .021767 | .001100 | ..... | ..... | |
| 18,000 | 90,000 | .023000 | .001233 | ..... | ..... | |
| 18,400 | 92,000 | .026333 | .003333 | ..... | ..... | |
| 19,200 | 96,000 | .033167 | .006834 | ..... | ..... | |
| 20,000 | 100,000 | .040000 | .006833 | ..... | ..... | |
| 20,800 | 104,000 | .048000 | .008000 | ..... | ..... | |
| 21,600 | 108,000 | .0667 | .0187 | ..... | ..... | |
| 22,400 | 112,000 | .1000 | .0333 | ..... | ..... | |
| 22,510 | 112,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 112,550 |
| Elastic limit, per square inch of original section | do... | 85,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .002900 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | 1".20 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".11, ".22[a], ".20[a] |

## End of Bar before Rolling.

### No. 6123.

Marks, 79 E.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000334 | ..... | ..... | |
| 10,000 | 50,000 | .001733 | .000366 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000334 | ..... | ..... | |
| 13,800 | 69,000 | .002400 | .000333 | ..... | ..... | Elastic limit. Load fell. |
| 13,000 | 65,000 | .003667 | .001267 | ..... | ..... | |
| 13,200 | 66,000 | .005333 | .001666 | ..... | ..... | |
| 13,400 | 67,000 | .008500 | .003167 | ..... | ..... | |
| 13,600 | 68,000 | .009300 | .000800 | ..... | ..... | |
| 14,000 | 70,000 | .010100 | .000800 | ..... | ..... | |
| 14,400 | 72,000 | .011433 | .001333 | ..... | ..... | |
| 15,200 | 76,000 | .014000 | .002567 | ..... | ..... | |
| 16,000 | 80,000 | .017500 | .003500 | ..... | ..... | |
| 16,800 | 84,000 | .021000 | .003500 | ..... | ..... | |
| 17,600 | 88,000 | .024000 | .003000 | ..... | ..... | |
| 18,400 | 92,000 | .028500 | .004500 | ..... | ..... | |
| 19,200 | 96,000 | .033000 | .004500 | ..... | ..... | |
| 20,000 | 100,000 | .038833 | .005833 | ..... | ..... | |
| 20,800 | 104,000 | .044333 | .005500 | ..... | ..... | |
| 21,600 | 108,000 | .0567 | .012367 | ..... | ..... | |
| 22,400 | 112,000 | .0700 | .0133 | ..... | ..... | |
| 23,060 | 115,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 115,300 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002400 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".18, ".35*. ".12 |

## End of Bar after Rolling.

### No. 6124.

Marks, 79 E B.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001033 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001767 | .000367 | 0. | ..... | |
| 10,800 | 54,000 | .001900 | .000133 | ..... | ..... | Elastic limit. Load fell. |
| 10,200 | 51,000 | .003600 | .001700 | ..... | ..... | |
| 10,400 | 52,000 | .004333 | .000733 | ..... | ..... | |
| 10,600 | 53,000 | .005167 | .000834 | ..... | ..... | |
| 10,800 | 54,000 | .007933 | .002766 | ..... | ..... | |
| 11,200 | 56,000 | .009000 | .001067 | ..... | ..... | |
| 11,600 | 58,000 | .010333 | .001333 | ..... | ..... | |
| 12,000 | 60,000 | .011500 | .001167 | ..... | ..... | |
| 12,800 | 64,000 | .014933 | .003433 | ..... | ..... | |
| 13,600 | 68,000 | .017500 | .002567 | ..... | ..... | |
| 14,400 | 72,000 | .020333 | .002833 | ..... | ..... | |
| 15,200 | 76,000 | .024000 | .003667 | ..... | ..... | |
| 16,000 | 80,000 | .028333 | .004333 | ..... | ..... | |
| 16,800 | 84,000 | .032500 | .004167 | ..... | ..... | |
| 17,600 | 88,000 | .038333 | .005833 | ..... | ..... | |
| 18,400 | 92,000 | .045333 | .007000 | ..... | ..... | |
| 19,200 | 96,000 | .054667 | .009334 | ..... | ..... | |
| 20,000 | 100,000 | .069333 | .014666 | ..... | ..... | |
| 20,800 | 104,000 | .1133 | .043967 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 104,000 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .1833 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1.″19 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ″.12, ″.24ᵃ, ″.19ᵇ |

## MIDDLE OF BAR BEFORE ROLLING.

## No. 6125.

Marks, 79 M.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000833 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001033 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000334 | ..... | ..... | |
| 10,000 | 50,000 | .001733 | .000366 | 0. | ..... | |
| 12,000 | 60,000 | .002100 | .000367 | ..... | ..... | |
| 13,600 | 68,000 | .002400 | .000300 | ..... | ..... | Elastic limit. Load fell. |
| 12,600 | 63,000 | .003433 | .001033 | ..... | ..... | |
| 12,800 | 64,000 | .003900 | .000467 | ..... | ..... | |
| 13,000 | 65,000 | .005333 | .001433 | ..... | ..... | |
| 13,200 | 66,000 | .008267 | .002434 | ..... | ..... | |
| 13,600 | 68,000 | .009333 | .001066 | ..... | ..... | |
| 14,000 | 70,000 | .010567 | .001234 | ..... | ..... | |
| 14,400 | 72,000 | .012000 | .001433 | ..... | ..... | |
| 15,200 | 76,000 | .014667 | .002667 | ..... | ..... | |
| 16,000 | 80,000 | .018000 | .003333 | ..... | ..... | |
| 16,800 | 84,000 | .021000 | .003000 | ..... | ..... | |
| 17,600 | 88,000 | .024600 | .003600 | ..... | ..... | |
| 18,400 | 92,000 | .028333 | .003733 | ..... | ..... | |
| 19,200 | 96,000 | .033000 | .004667 | ..... | ..... | |
| 20,000 | 100,000 | .038000 | .005000 | ..... | ..... | |
| 20,800 | 104,000 | .045000 | .007000 | ..... | ..... | |
| 21,600 | 108,000 | .054333 | .009333 | ..... | ..... | |
| 22,400 | 112,000 | .0767 | .022367 | ..... | ..... | |
| 23,010 | 115,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 115,050 |
| Elastic limit per square inch of original section | do... | 68,000 |
| Elongation per inch after rupture | inch.. | .1900 |
| Elongation per inch under strain at elastic limit | do... | .002400 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".16, ".30*, "11 |

## MIDDLE OF BAR AFTER ROLLING.

### No. 6126.

Marks, 79 M B.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001033 | .000366 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000334 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | .000033 | .000033 | |
| 11,000 | 55,000 | .001900 | .000200 | ..... | ..... | Elastic limit. |
| 11,200 | 56,000 | .002667 | .000767 | ..... | ..... | |
| | | | | | | Load fell. |
| 10,400 | 52,000 | .003267 | .000600 | ..... | ..... | |
| 10,600 | 53,000 | .003667 | .000400 | ..... | ..... | |
| 10,800 | 54,000 | .005733 | .002066 | ..... | ..... | |
| 11,000 | 55,000 | .006600 | .000867 | ..... | ..... | |
| 11,200 | 56,000 | .009000 | .002400 | ..... | ..... | |
| 11,600 | 58,000 | .010333 | .001333 | ..... | ..... | |
| 12,000 | 60,000 | .011067 | .000734 | ..... | ..... | |
| 12,800 | 64,000 | .013967 | .002900 | ..... | ..... | |
| 13,600 | 68,000 | .017333 | .003366 | ..... | ..... | |
| 14,400 | 72,000 | .020000 | .002667 | ..... | ..... | |
| 15,200 | 76,000 | .024000 | .004000 | ..... | ..... | |
| 16,000 | 80,000 | .028000 | .004000 | ..... | ..... | |
| 16,800 | 84,000 | .032833 | .004833 | ..... | ..... | |
| 17,600 | 88,000 | .038167 | .005334 | ..... | ..... | |
| 18,400 | 92,000 | .044667 | .006500 | ..... | ..... | |
| 19,200 | 96,000 | .053333 | .008666 | ..... | ..... | |
| 20,000 | 100,000 | .069000 | .015667 | ..... | ..... | |
| 21,020 | 105,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 105,100 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .1800 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1″.5 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.10, ″.31*, ″.13 |

## No. 6155.

**Marks, A. E. 1.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | .000033 | .000033 | |
| 12,000 | 60,000 | .002000 | .000300 | ..... | ..... | |
| 13,000 | 65,000 | .002200 | .000200 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000167 | ..... | ..... | |
| 15,000 | 75,000 | .002600 | .000233 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .002733 | .000133 | ..... | ..... | |
| 15,400 | 77,000 | .010633 | .007900 | ..... | ..... | |
| 15,600 | 78,000 | .011033 | .000400 | ..... | ..... | |
| 15,800 | 79,000 | .011367 | .000334 | ..... | ..... | |
| 16,000 | 80,000 | .012000 | .000633 | ..... | ..... | |
| 16,400 | 82,000 | .013600 | .001600 | ..... | ..... | |
| 16,800 | 84,000 | .015033 | .001433 | ..... | ..... | |
| 17,200 | 86,000 | .016167 | .001134 | ..... | ..... | |
| 17,600 | 88,000 | .017767 | .001600 | ..... | ..... | |
| 18,400 | 92,000 | .021667 | .003900 | ..... | ..... | |
| 19,200 | 96,000 | .024700 | .003033 | ..... | ..... | |
| 20,000 | 100,000 | .029100 | .004400 | ..... | ..... | |
| 20,800 | 104,000 | .033000 | .003900 | ..... | ..... | |
| 21,600 | 108,000 | .037833 | .004833 | ..... | ..... | |
| 22,400 | 112,000 | .043667 | .005834 | ..... | ..... | |
| 23,200 | 116,000 | .051167 | .007500 | ..... | ..... | |
| 24,000 | 120,000 | .061667 | .010500 | ..... | ..... | |
| 24,800 | 124,000 | .0900 | .028333 | ..... | ..... | |
| 25,110 | 125,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 125,550 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .002600 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, interspersed with fine granulation |
| Elongation of inch sections | | ".11, ".24*, ".12 |

## No. 6156.

Marks, A–E–2.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | 0. | ..... | |
| 14,000 | 70,000 | .002367 | .000334 | ..... | ..... | |
| 15,000 | 75,000 | .002600 | .000233 | ..... | ..... | |
| 15,200 | 76,000 | .002633 | .000033 | ..... | ..... | |
| 15,400 | 77,000 | .002667 | .000034 | ..... | ..... | Elastic limit. |
| | | .013933 | .011266 | ..... | ..... | |
| 15,600 | 78,000 | .014400 | .000467 | ..... | ..... | |
| 16,000 | 80,000 | .016333 | .001933 | ..... | ..... | |
| 16,800 | 84,000 | .019167 | .002834 | ..... | ..... | |
| 17,600 | 88,000 | .023400 | .004233 | ..... | ..... | |
| 18,400 | 92,000 | .028333 | .004933 | ..... | ..... | |
| 19,200 | 96,000 | .031600 | .003267 | ..... | ..... | |
| 20,000 | 100,000 | .036667 | .005067 | ..... | ..... | |
| 20,800 | 104,000 | .042500 | .005833 | ..... | ..... | |
| 21,600 | 108,000 | .050000 | .007500 | ..... | ..... | |
| 22,400 | 112,000 | .061000 | .011000 | ..... | ..... | |
| 23,200 | 116,000 | .0833 | .0223 | ..... | ..... | |
| 23,700 | 118,500 | .1333 | .0500 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 118,500 |
| Elastic limit per square inch of original section | do... | 77,000 |
| Elongation per inch after rupture | inch.. | .2033 |
| Elongation per inch under strain at elastic limit | do... | .002667 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".18, ".34", ".14 |

## No. 6157.

**Marks, A–M–1.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | 0. | ..... | |
| 14,000 | 70,000 | .002367 | .000334 | ..... | ..... | |
| 15,200 | 76,000 | .002633 | .000266 | ..... | ..... | Elastic limit. |
| 15,400 | 77,000 | .014500 | .011867 | ..... | ..... | |
| 15,600 | 78,000 | .015333 | .000833 | ..... | ..... | |
| 15,800 | 79,000 | .016000 | .000667 | ..... | ..... | |
| 16,000 | 80,000 | .017000 | .001000 | ..... | ..... | |
| 16,400 | 82,000 | .018333 | .001333 | ..... | ..... | |
| 16,800 | 84,000 | .020267 | .001934 | ..... | ..... | |
| 17,600 | 88,000 | .024600 | .004333 | ..... | ..... | |
| 18,400 | 92,000 | .028333 | .003733 | ..... | ..... | |
| 19,200 | 96,000 | .032667 | .004334 | ..... | ..... | |
| 20,000 | 100,000 | .037500 | .004833 | ..... | ..... | |
| 20,800 | 104,000 | .044000 | .006500 | ..... | ..... | |
| 21,600 | 108,000 | .053000 | .009000 | ..... | ..... | |
| 22,400 | 112,000 | .064833 | .011833 | ..... | ..... | |
| 23,200 | 116,000 | .0900 | .025167 | ..... | ..... | |
| 23,420 | 117,100 | .1300 | .0400 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 117,100 |
| Elastic limit per square inch of original section | do... | 76,000 |
| Elongation per inch after rupture | inch.. | .1933 |
| Elongation per inch under strain at elastic limit | do... | .002633 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1."5 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".14, ".32*, ".12 |

## No. 6158.

Marks, A–M–2.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | 0. | ..... | |
| 14,000 | 70,000 | .002400 | .000367 | ..... | ..... | |
| 15,000 | 75,000 | .002667 | .000267 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .009667 | .007000 | ..... | ..... | |
| 15,400 | 77,000 | .010667 | .001000 | ..... | ..... | |
| 15,600 | 78,000 | .011167 | .000500 | ..... | ..... | |
| 15,800 | 79,000 | .011467 | .000300 | ..... | ..... | |
| 16,000 | 80,000 | .012333 | .000866 | ..... | ..... | |
| 16,400 | 82,000 | .013500 | .001167 | ..... | ..... | |
| 16,800 | 84,000 | .015100 | .001600 | ..... | ..... | |
| 17,600 | 88,000 | .018333 | .003233 | ..... | ..... | |
| 18,400 | 92,000 | .021467 | .003134 | ..... | ..... | |
| 19,200 | 96,000 | .025000 | .003533 | ..... | ..... | |
| 20,000 | 100,000 | .028500 | .003500 | ..... | ..... | |
| 20,800 | 104,000 | .032833 | .004333 | ..... | ..... | |
| 21,600 | 108,000 | .038000 | .005167 | ..... | ..... | |
| 22,400 | 112,000 | .044000 | .006000 | ..... | ..... | |
| 23,200 | 116,000 | .052500 | .008500 | ..... | ..... | |
| 24,000 | 120,000 | .064000 | .011500 | ..... | ..... | |
| 24,800 | 124,000 | .0967 | .0327 | ..... | ..... | |
| 24,910 | 124,550 | .1067 | .0100 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 124,550 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1400 |
| Elongation per inch under strain at elastic limit | do... | .002667 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | 1.″3 from neck |
| Character of broken surface | | fine granular, radiating from the center |
| Elongation of inch sections | | ″.14, ″.17⁰, ″.11 |

## No. 6159.

Marks, A R 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | 0. | ..... | |
| 14,000 | 70,000 | .002333 | .000333 | ..... | ..... | |
| 14,200 | 71,000 | .002400 | .000067 | ..... | ..... | |
| 14,400 | 72,000 | .002433 | .000033 | ..... | ..... | Elastic limit. |
| 14,600 | 73,000 | .018667 | .016234 | ..... | ..... | |
| 14,800 | 74,000 | .019000 | .000333 | ..... | ..... | |
| 15,000 | 75,000 | .019267 | .000267 | ..... | ..... | |
| 15,200 | 76,000 | .019500 | .000233 | ..... | ..... | |
| 15,600 | 78,000 | .021067 | .001567 | ..... | ..... | |
| 16,000 | 80,000 | .022667 | .001600 | ..... | ..... | |
| 16,400 | 82,000 | .025000 | .002333 | ..... | ..... | |
| 16,800 | 84,000 | .026667 | .001667 | ..... | ..... | |
| 17,600 | 88,000 | .031667 | .005000 | ..... | ..... | |
| 18,400 | 92,000 | .036667 | .005000 | ..... | ..... | |
| 19,200 | 96,000 | .042500 | .005833 | ..... | ..... | |
| 20,000 | 100,000 | .050333 | .007833 | ..... | ..... | |
| 20,800 | 104,000 | .059333 | .009000 | ..... | ..... | |
| 21,600 | 108,000 | .076667 | .017334 | ..... | ..... | |
| 22,400 | 112,000 | .1200<br>.1433 | .043333<br>.0233 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,000 |
| Elastic limit per square inch of original section | do... | 72,000 |
| Elongation per inch after rupture | inch.. | .1867 |
| Elongation per inch under strain at elastic limit | do... | .002433 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".14, ".31*, ".11 |

No. 6160.

Marks, A. R–2
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | 0. | ..... | |
| 12,200 | 61,000 | .002067 | .000034 | ..... | ..... | |
| 12,400 | 62,000 | .002100 | .000033 | ..... | ..... | Elastic limit. |
| 12,600 | 63,000 | .010333 | .008233 | ..... | ..... | |
| 12,800 | 64,000 | .010800 | .000467 | ..... | ..... | |
| 13,000 | 65,000 | .011267 | .000467 | ..... | ..... | |
| 13,200 | 66,000 | .011700 | .000433 | ..... | ..... | |
| 13,600 | 68,000 | .013567 | .001867 | ..... | ..... | |
| 14,000 | 70,000 | .015000 | .001433 | ..... | ..... | |
| 14,400 | 72,000 | .016600 | .001600 | ..... | ..... | |
| 15,200 | 76,000 | .020167 | .003567 | ..... | ..... | |
| 16,000 | 80,000 | .024200 | .004033 | ..... | ..... | |
| 16,800 | 84,000 | .027667 | .003467 | ..... | ..... | |
| 17,600 | 88,000 | .032967 | .005300 | ..... | ..... | |
| 18,400 | 92,000 | .038100 | .005133 | ..... | ..... | |
| 19,200 | 96,000 | .044333 | .006233 | ..... | ..... | |
| 20,000 | 100,000 | .053000 | .008667 | ..... | ..... | |
| 20,800 | 104,000 | .066000 | .013000 | ..... | ..... | |
| 21,600 | 108,000 | .0900 | .0240 | ..... | ..... | |
| 21,910 | 109,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 109,550 |
| Elastic limit per square inch of original section | do... | 62,000 |
| Elongation per inch after rupture | inch.. | .1700 |
| Elongation per inch under strain at elastic limit | do... | .002100 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent. of original section | | 37.1 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".10, ".13, ".28* |

## No. 6262.

Marks, 78 B.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | 0. | ..... | |
| 14,000 | 70,000 | .002400 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002433 | .000083 | ..... | ..... | Elastic limit. |
| 14,400 | 72,000 | .002583 | .000100 | ..... | ..... | |
| 14,600 | 73,000 | .002667 | .000134 | ..... | ..... | |
| 14,800 | 74,000 | .005500 | .002833 | ..... | ..... | |
| 15,000 | 75,000 | .005667 | .000167 | ..... | ..... | |
| 15,200 | 76,000 | .006033 | .000366 | ..... | ..... | |
| 15,400 | 77,000 | .006600 | .000567 | ..... | ..... | |
| 15,600 | 78,000 | .007167 | .000567 | ..... | ..... | |
| 16,000 | 80,000 | .008300 | .001133 | ..... | ..... | |
| 16,400 | 82,000 | .009333 | .001033 | ..... | ..... | |
| 16,800 | 84,000 | .010467 | .001134 | ..... | ..... | |
| 17,200 | 86,000 | .011500 | .001033 | ..... | ..... | |
| 17,600 | 88,000 | .012833 | .001333 | ..... | ..... | |
| 18,400 | 92,000 | .015333 | .002500 | ..... | ..... | |
| 19,200 | 96,000 | .018000 | .002667 | ..... | ..... | |
| 20,000 | 100,000 | .020733 | .002733 | ..... | ..... | |
| 20,800 | 104,000 | .023433 | .002700 | ..... | ..... | |
| 21,600 | 108,000 | .027000 | .003567 | ..... | ..... | |
| 22,400 | 112,000 | .030400 | .003400 | ..... | ..... | |
| 23,200 | 116,000 | .034667 | .004267 | ..... | ..... | |
| 24,000 | 120,000 | .039933 | .005266 | ..... | ..... | |
| 24,800 | 124,000 | .046000 | .006067 | ..... | ..... | |
| 25,600 | 128,000 | .055333 | .009333 | ..... | ..... | |
| 26,710 | 133,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 133,550 |
| Elastic limit per square inch of original section | do... | 71,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .002433 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".14, ".24", ".07 |

## No. 6263.

Marks, 78 B R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | Elastic limit. |
| 12,200 | 61,000 | .002967 | .000934 | ..... | ..... | |
| 12,400 | 62,000 | .003933 | .000966 | ..... | ..... | |
| 12,600 | 63,000 | .005600 | .001667 | ..... | ..... | |
| 12,800 | 64,000 | .005833 | .000233 | ..... | ..... | |
| 13,000 | 65,000 | .006267 | .000434 | ..... | ..... | |
| 13,200 | 66,000 | .006767 | .000500 | ..... | ..... | |
| 13,600 | 68,000 | .007967 | .001200 | ..... | ..... | |
| 14,000 | 70,000 | .009133 | .001166 | ..... | ..... | |
| 14,400 | 72,000 | .010267 | .001134 | ..... | ..... | |
| 15,200 | 76,000 | .012567 | .002300 | ..... | ..... | |
| 16,000 | 80,000 | .015033 | .002466 | ..... | ..... | |
| 16,800 | 84,000 | .017167 | .002134 | ..... | ..... | |
| 17,600 | 88,000 | .020167 | .003000 | ..... | ..... | |
| 18,400 | 92,000 | .023333 | .003166 | ..... | ..... | |
| 19,200 | 96,000 | .026667 | .003334 | ..... | ..... | |
| 20,000 | 100,000 | .030067 | .003400 | ..... | ..... | |
| 20,800 | 104,000 | .034000 | .003933 | ..... | ..... | |
| 21,600 | 108,000 | .039667 | .005667 | ..... | ..... | |
| 22,400 | 112,000 | .044500 | .004833 | ..... | ..... | |
| 23,200 | 116,000 | .054933 | .010433 | ..... | ..... | |
| 24,640 | 123,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 123,200 |
| Elastic limit per square inch of original section | do... | 60,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .002033 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent. of original section | | 34.0 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky, interspersed with fine granulation |
| Elongation of inch sections | | ".13, ".25*, ".09 |

No. 6264.

*Marks, 78 R.*
*Diameter, ".505.*
*Sectional area, .20 square inch.*
*Gauged length, 3".*

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | | |
| 2,000 | 10,000 | .000300 | .000167 | | | |
| 4,000 | 20,000 | .000633 | .000333 | | | |
| 6,000 | 30,000 | .000967 | .000334 | | | |
| 8,000 | 40,000 | .001300 | .000333 | 0. | | |
| 10,000 | 50,000 | .001667 | .000367 | 0. | | |
| 12,000 | 60,000 | .002000 | .000333 | | | |
| 12,200 | 61,000 | .002033 | .000033 | | | |
| 12,400 | 62,000 | .002067 | .000034 | | | |
| 12,600 | 63,000 | .002133 | .000066 | | | |
| 12,800 | 64,000 | .002200 | .000067 | | | Elastic limit. |
| 13,000 | 65,000 | .009000 | .006800 | | | |
| 13,200 | 66,000 | .010067 | .001067 | | | |
| 13,400 | 67,000 | .010400 | .000333 | | | |
| 13,600 | 68,000 | .011000 | .000600 | | | |
| 13,800 | 69,000 | .011667 | .000667 | | | |
| 14,000 | 70,000 | .012367 | .000700 | | | |
| 14,400 | 72,000 | .013933 | .001566 | | | |
| 14,800 | 74,000 | .015333 | .001400 | | | |
| 15,200 | 76,000 | .017000 | .001667 | | | |
| 15,600 | 78,000 | .018333 | .001333 | | | |
| 16,000 | 80,000 | .020200 | .001867 | | | |
| 16,900 | 84,000 | .023667 | .003467 | | | |
| 17,600 | 88,000 | .027833 | .004166 | | | |
| 18,400 | 92,000 | .032500 | .004667 | | | |
| 19,200 | 96,000 | .038000 | .005500 | | | |
| 20,000 | 100,000 | .044667 | .006667 | | | |
| 20,800 | 104,000 | .053333 | .008666 | | | |
| 21,600 | 108,000 | .068333 | .015000 | | | |
| 22,400 | 112,000 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,000 |
| Elastic limit per square inch of original section | do.. | 64,000 |
| Elongation per inch after rupture | inch.. | .2033 |
| Elongation per inch under strain at elastic limit | do... | .002200 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".13, ".35*, ".13 |

No. 6265.

Marks, 78 R. R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000267 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000933 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000367 | 0. | ..... | |
| 10,000 | 50,000 | .001600 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .001800 | .000200 | ..... | ..... | |
| 11,200 | 56,000 | .001833 | .000033 | ..... | ..... | |
| 11,400 | 57,000 | .001867 | .000034 | ..... | ..... | |
| 11,600 | 58,000 | .001933 | .000066 | ..... | ..... | Elastic limit. |
| 11,800 | 59,000 | .010667 | .008734 | ..... | ..... | |
| 12,000 | 60,000 | .011733 | .001066 | ..... | ..... | |
| 12,400 | 62,000 | .012500 | .000767 | ..... | ..... | |
| 12,800 | 64,000 | .013933 | .001433 | ..... | ..... | |
| 13,200 | 66,000 | .015500 | .001567 | ..... | ..... | |
| 13,600 | 68,000 | .017167 | .001667 | ..... | ..... | |
| 14,400 | 72,000 | .021000 | .003833 | ..... | ..... | |
| 15,200 | 76,000 | .025000 | .004000 | ..... | ..... | |
| 16,000 | 80,000 | .028833 | .003833 | ..... | ..... | |
| 16,800 | 84,000 | .034000 | .005167 | ..... | ..... | |
| 17,600 | 88,000 | .040000 | .006000 | ..... | ..... | |
| 18,400 | 92,000 | .049000 | .009000 | ..... | ..... | |
| 19,200 | 96,000 | .058333 | .009333 | ..... | ..... | |
| 20,000 | 100,000 | .077000 | .018667 | ..... | ..... | |
| 20,870 | 104,350 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 104,350 |
| Elastic limit per square inch of original section | do... | 58,000 |
| Elongation per inch after rupture | inch.. | .2033 |
| Elongation per inch under strain at elastic limit | do... | .001933 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".14, ".33*, ".14 |

No. 6289.

Marks, A. I. G.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002300 | .000333 | ..... | ..... | |
| 15,000 | 75,000 | .002467 | .000167 | ..... | ..... | |
| 15,200 | 76,000 | .002500 | .000033 | ..... | ..... | Elastic limit |
| 15,400 | 77,000 | .003000 | .000500 | ..... | ..... | |
| | | .010000 | .007000 | ..... | ..... | |
| 15,600 | 78,000 | .010933 | .000933 | ..... | ..... | |
| 15,800 | 79,000 | .011333 | .000400 | ..... | ..... | |
| 16,000 | 80,000 | .012167 | .000834 | ..... | ..... | |
| 16,400 | 82,000 | .013000 | .000833 | ..... | ..... | |
| 16,800 | 84,000 | .014567 | .001567 | ..... | ..... | |
| 17,200 | 86,000 | .015733 | .001166 | ..... | ..... | |
| 17,600 | 88,000 | .017333 | .001600 | ..... | ..... | |
| 18,000 | 90,000 | .019167 | .001834 | ..... | ..... | |
| 18,400 | 92,000 | .020333 | .001166 | ..... | ..... | |
| 19,200 | 96,000 | .023667 | .003334 | ..... | ..... | |
| 20,000 | 100,000 | .027067 | .003400 | ..... | ..... | |
| 20,800 | 104,000 | .030667 | .003600 | ..... | ..... | |
| 21,600 | 108,000 | .035000 | .004333 | ..... | ..... | |
| 22,400 | 112,000 | .0433 | .0083 | ..... | ..... | |
| 23,200 | 116,000 | .0500 | .0067 | ..... | ..... | |
| 24,000 | 120,000 | .0600 | .0100 | ..... | ..... | |
| 24,800 | 124,000 | .0767 | .0167 | ..... | ..... | |
| 25,310 | 126,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 126,550 |
| Elastic limit per square inch of original section | do... | 76,000 |
| Elongation per inch after rupture | inch.. | .1700 |
| Elongation per inch under strain at elastic limit | do... | .002500 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine silky, dark gray |
| Elongation of inch sections | | ".11, ".28*, ".12 |

No. 6290.

Marks, A I R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000167 | .000167 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000166 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000300 | ..... | ..... | |
| 13,600 | 68,000 | .002300 | .000333 | ..... | ..... | |
| 13,800 | 69,000 | .002333 | .000033 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .017333 | .005000 | ..... | ..... | |
| 14,200 | 71,000 | .017967 | .000634 | ..... | ..... | |
| 14,400 | 72,000 | .018933 | .000966 | ..... | ..... | |
| 14,600 | 73,000 | .020000 | .001067 | ..... | ..... | |
| 14,800 | 74,000 | .020833 | .000833 | ..... | ..... | |
| 15,200 | 76,000 | .022667 | .001834 | ..... | ..... | |
| 15,600 | 78,000 | .025167 | .002500 | ..... | ..... | |
| 16,000 | 80,000 | .027400 | .002233 | ..... | ..... | |
| 16,800 | 84,000 | .032333 | .004933 | ..... | ..... | |
| 17,600 | 88,000 | .038167 | .005834 | ..... | ..... | |
| 18,400 | 92,000 | .0500 | .011833 | ..... | ..... | |
| 19,200 | 96,000 | .0600 | .0100 | ..... | ..... | |
| 20,000 | 100,000 | .0733 | .0133 | ..... | ..... | |
| 20,800 | 104,000 | .1167 | .0434 | ..... | ..... | |
| 20,920 | 104,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 104,600 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .2233 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine silky, dark gray |
| Elongation of inch sections | | ".18, ".38", ".16 |

## No. 6291.

**Marks, A I W.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000300 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000366 | ..... | ..... | |
| 15,600 | 78,000 | .002600 | .000267 | ..... | ..... | |
| 15,800 | 79,000 | .002633 | .000033 | ..... | ..... | Elastic limit. |
| 16,000 | 80,000 | .006767 | .006134 | ..... | ..... | |
| 16,200 | 81,000 | .009333 | .000566 | ..... | ..... | |
| 16,400 | 82,000 | .009700 | .000367 | ..... | ..... | |
| 16,600 | 83,000 | .010033 | .000333 | ..... | ..... | |
| 16,800 | 84,000 | .010500 | .000467 | ..... | ..... | |
| 17,200 | 86,000 | .012000 | .001200 | ..... | ..... | |
| 17,600 | 88,000 | .013000 | .001000 | ..... | ..... | |
| 18,000 | 90,000 | .015000 | .002000 | ..... | ..... | |
| 18,400 | 92,000 | .016100 | .001100 | ..... | ..... | |
| 19,200 | 96,000 | .018067 | .001967 | ..... | ..... | |
| 20,000 | 100,000 | .021033 | .002966 | ..... | ..... | |
| 20,800 | 104,000 | .023833 | .002800 | ..... | ..... | |
| 21,600 | 108,000 | .026833 | .003000 | ..... | ..... | |
| 22,400 | 112,000 | .030667 | .003834 | ..... | ..... | |
| 23,200 | 116,000 | .035000 | .004333 | ..... | ..... | |
| 24,000 | 120,000 | .039667 | .004667 | ..... | ..... | |
| 24,800 | 124,000 | .0467 | .007033 | ..... | ..... | |
| 25,600 | 128,000 | .0567 | .0100 | ..... | ..... | |
| 26,400 | 132,000 | .0767 | .0200 | ..... | ..... | |
| 26,990 | 134,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 134,450 |
| Elastic limit per square inch of original section | do... | 79,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .002633 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, dark gray |
| Elongation of inch sections | | ".10, ".26, ".11 |

## No. 6292.

Marks, 78 B X.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | 0. | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | ..... | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000366 | ..... | ..... | |
| 15,000 | 75,000 | .002500 | .000167 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .004667 | .002167 | ..... | ..... | |
| 15,400 | 77,000 | .005000 | .000333 | ..... | ..... | |
| 15,600 | 78,000 | .005333 | .000333 | ..... | ..... | |
| 15,800 | 79,000 | .005767 | .000434 | ..... | ..... | |
| 16,000 | 80,000 | .006600 | .000833 | ..... | ..... | |
| 16,400 | 82,000 | .007433 | .000833 | ..... | ..... | |
| 16,800 | 84,000 | .008400 | .000967 | ..... | ..... | |
| 17,200 | 86,000 | .009633 | .001233 | ..... | ..... | |
| 17,600 | 88,000 | .010967 | .001334 | ..... | ..... | |
| 18,000 | 90,000 | .011767 | .000800 | ..... | ..... | |
| 18,800 | 94,000 | .014000 | .002233 | ..... | ..... | |
| 19,600 | 98,000 | .017067 | .003067 | ..... | ..... | |
| 20,400 | 102,000 | .021000 | .003933 | ..... | ..... | |
| 21,200 | 106,000 | .022500 | .001500 | ..... | ..... | |
| 22,000 | 110,000 | .024667 | .002167 | ..... | ..... | |
| 22,600 | 113,000 | .027633 | .002966 | ..... | ..... | |
| 27,210 | 136,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 136,050 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1583 |
| Elongation per inch under strain at elastic limit | | .002500 |
| Reduction in diameter at point of rupture | | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | "1.2 from neck |
| Character of broken surface | | silky interspersed with fine granulation, cup shaped |
| Elongation of inch sections | | ".20", ".17", ".09 |

No. 6293.

Marks, 78 B R X.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000167 | .000167 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000133 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | ..... | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 12,400 | 62,000 | .002033 | .000066 | ..... | ..... | |
| 12,800 | 64,000 | .002100 | .000067 | ..... | ..... | |
| 13,200 | 66,000 | .002200 | .000100 | ..... | ..... | |
| 13,600 | 68,000 | .002267 | .000067 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000066 | ..... | ..... | |
| 14,200 | 71,000 | .002367 | .000034 | ..... | ..... | Elastic limit. |
| 14,400 | 72,000 | .003967 | .001600 | ..... | ..... | |
| 14,800 | 74,000 | .005467 | .001500 | ..... | ..... | |
| 15,200 | 76,000 | .008300 | .002833 | ..... | ..... | |
| 15,600 | 78,000 | .008933 | .000633 | ..... | ..... | |
| 16,000 | 80,000 | .009967 | .001034 | ..... | ..... | |
| 16,800 | 84,000 | .011800 | .001833 | ..... | ..... | |
| 17,600 | 88,000 | .014967 | .003167 | ..... | ..... | |
| 18,400 | 92,000 | .017233 | .002266 | ..... | ..... | |
| 19,200 | 96,000 | .019800 | .002567 | ..... | ..... | |
| 20,000 | 100,000 | .022400 | .002600 | ..... | ..... | |
| 20,800 | 104,000 | .025133 | .002733 | ..... | ..... | |
| 21,600 | 108,000 | .028733 | .003600 | ..... | ..... | |
| 22,400 | 112,000 | .032867 | .004134 | ..... | ..... | |
| 23,200 | 116,000 | .036633 | .003766 | ..... | ..... | |
| 24,000 | 120,000 | .042300 | .005667 | ..... | ..... | |
| 26,520 | 132,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 132,600 |
| Elastic limit per square inch of original section | do... | 71,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .002367 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".03 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".27*, ".11 ".07 |

## No. 6294.

Marks, 78 B R *.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 12,400 | 62,000 | .002067 | .000034 | ..... | ..... | |
| 12,800 | 64,000 | .002133 | .000066 | ..... | ..... | |
| 13,200 | 66,000 | .002200 | .000067 | ..... | ..... | |
| 13,600 | 68,000 | .002300 | .000100 | ..... | ..... | |
| 14,000 | 70,000 | .002400 | .000100 | ..... | ..... | |
| 14,200 | 71,000 | .002400 | 0. | ..... | ..... | |
| 14,400 | 72,000 | .002433 | .000033 | ..... | ..... | |
| 14,600 | 73,000 | .002467 | .000034 | ..... | ..... | |
| 14,800 | 74,000 | .002500 | .000033 | ..... | ..... | Elastic limit. |
| 15,000 | 75,000 | .008067 | .005567 | ..... | ..... | |
| 15,200 | 76,000 | .008500 | .000433 | ..... | ..... | |
| 15,600 | 78,000 | .009633 | .001133 | ..... | ..... | |
| 16,000 | 80,000 | .010700 | .001067 | ..... | ..... | |
| 16,800 | 84,000 | .013633 | .002933 | ..... | ..... | |
| 17,600 | 88,000 | .015400 | .001767 | ..... | ..... | |
| 18,400 | 92,000 | .021467 | .006067 | ..... | ..... | |
| 19,200 | 96,000 | .021900 | .000433 | ..... | ..... | |
| 20,000 | 100,000 | .023800 | .001900 | ..... | ..... | |
| 20,800 | 104,000 | .026400 | .002600 | ..... | ..... | |
| 21,600 | 108,000 | .030733 | .004333 | ..... | ..... | |
| 22,400 | 112,000 | .034400 | .003667 | ..... | ..... | |
| 23,200 | 116,000 | .039067 | .004667 | ..... | ..... | |
| 24,000 | 120,000 | .045067 | .006000 | ..... | ..... | |
| 26,100 | 130,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 130,500 |
| Elastic limit per square inch of original section | do... | 74,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .002500 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | fine silky; cup shaped |
| Elongation of inch sections | | ".09, ".30*, ".10 |

## No. 6306.

**Marks, A I B.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000267 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000933 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000366 | ..... | ..... | |
| 14,400 | 72,000 | .002400 | .000067 | ..... | ..... | |
| 14,600 | 73,000 | .002433 | .000033 | ..... | ..... | Elastic limit. |
| 14,800 | 74,000 | .011000 | .008567 | ..... | ..... | |
| 15,000 | 75,000 | .011333 | .000333 | ..... | ..... | |
| 15,200 | 76,000 | .012000 | .000667 | ..... | ..... | |
| 15,600 | 78,000 | .012600 | .000600 | ..... | ..... | |
| 16,000 | 80,000 | .013833 | .001233 | ..... | ..... | |
| 16,800 | 84,000 | .016667 | .002834 | ..... | ..... | |
| 17,600 | 88,000 | .020667 | .004000 | ..... | ..... | |
| 18,400 | 92,000 | .028667 | .008000 | ..... | ..... | |
| 19,200 | 96,000 | .027333 | .003666 | ..... | ..... | |
| 20,000 | 100,000 | .034667 | .007334 | ..... | ..... | |
| 20,800 | 104,000 | .036767 | .002100 | ..... | ..... | |
| 21,600 | 108,000 | .042000 | .005233 | ..... | ..... | |
| 22,400 | 112,000 | .050767 | .008767 | ..... | ..... | |
| 23,200 | 116,000 | .060000 | .009233 | ..... | ..... | |
| 24,000 | 120,000 | .080000 | .020000 | ..... | ..... | |
| 24,510 | 122,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 122,550 |
| Elastic limit per square inch of original section | do... | 73,000 |
| Elongation per inch after rupture | inch.. | .1833 |
| Elongation per inch under strain at elastic limit | do... | .002433 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1".34 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | .11, .29*, .15 |

No. 6307.

Marks, A I B 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000334 | ..... | ..... | |
| 15,000 | 75,000 | .002567 | .000200 | ..... | ..... | |
| 16,000 | 80,000 | .002733 | .000166 | ..... | ..... | |
| 16,200 | 81,000 | .002800 | .000067 | ..... | ..... | Elastic limit. |
| 16,400 | 82,000 | .003333 | .000533 | ..... | ..... | |
| | | .008000 | .004667 | ..... | ..... | |
| 16,600 | 83,000 | .008433 | .000433 | ..... | ..... | |
| 16,800 | 84,000 | .008733 | .000300 | ..... | ..... | |
| 17,200 | 86,000 | .010000 | .001267 | ..... | ..... | |
| 17,600 | 88,000 | .011267 | .001267 | ..... | ..... | |
| 18,400 | 92,000 | .013500 | .002233 | ..... | ..... | |
| 19,200 | 96,000 | .016000 | .002500 | ..... | ..... | |
| 20,000 | 100,000 | .018667 | .002667 | ..... | ..... | |
| 20,800 | 104,000 | .020667 | .002000 | ..... | ..... | |
| 21,600 | 108,000 | .023500 | .002833 | ..... | ..... | |
| 22,400 | 112,000 | .026667 | .003167 | ..... | ..... | |
| 23,200 | 116,000 | .030000 | .003333 | ..... | ..... | |
| 24,000 | 120,000 | .034000 | .004000 | ..... | ..... | |
| 24,800 | 124,000 | .038667 | .004667 | ..... | ..... | |
| 27,890 | 139,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 139,450 |
| Elastic limit per square inch of original section | do... | 81,000 |
| Elongation per inch after rupture | inch.. | .1467 |
| Elongation per inch under strain at elastic limit | do... | .002800 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, interspersed with fine granulation radiating from the center. |
| Elongation of inch sections | | ".10, ".24*, ".10 |

## No. 6308.

**Marks, A I Y.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | .0 | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .002167 | .000467 | ..... | ..... | |
| 13,400 | 67,000 | .002333 | .000166 | ..... | ..... | Elastic limit. |
| 13,600 | 68,000 | .003333 | .001000 | ..... | ..... | |
| | | .019333 | .016000 | ..... | ..... | |
| 13,800 | 69,000 | .020333 | .001000 | ..... | ..... | |
| 14,000 | 70,000 | .020933 | .000600 | ..... | ..... | |
| 14,200 | 71,000 | .022000 | .001067 | ..... | ..... | |
| 14,400 | 72,000 | .023167 | .001167 | ..... | ..... | |
| 14,800 | 74,000 | .025333 | .002166 | ..... | ..... | |
| 15,200 | 76,000 | .028000 | .002667 | ..... | ..... | |
| 16,000 | 80,000 | .034000 | .006000 | ..... | ..... | |
| 16,800 | 84,000 | .041000 | .007000 | ..... | ..... | |
| 17,600 | 88,000 | .050000 | .009000 | ..... | ..... | |
| 18,400 | 92,000 | .063333 | .013333 | ..... | ..... | |
| 19,200 | 96,000 | .083333 | .020000 | ..... | ..... | |
| 19,900 | 99,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 99,500 |
| Elastic limit per square inch of original section | do... | 67,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .165 |
| Reduction in area after rupture, per cent of original section | | 54.6 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".15, ".41*, ".16 |

No. 6309.

Marks, A I R 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000367 | ..... | ..... | |
| 13,800 | 69,000 | .002400 | .000333 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .016333 | .013933 | ..... | ..... | |
| 14,200 | 71,000 | .017667 | .001334 | ..... | ..... | |
| 14,400 | 72,000 | .019867 | .002200 | ..... | ..... | |
| 15,200 | 76,000 | .022667 | .002800 | ..... | ..... | |
| 16,000 | 80,000 | .027767 | .005100 | ..... | ..... | |
| 16,800 | 84,000 | .032333 | .004566 | ..... | ..... | |
| 17,600 | 88,000 | .038333 | .006000 | ..... | ..... | |
| 18,400 | 92,000 | .046667 | .008334 | ..... | ..... | |
| 19,200 | 96,000 | .055333 | .008666 | ..... | ..... | |
| 20,000 | 100,000 | .068333 | .013000 | ..... | ..... | |
| 21,090 | 105,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 105,450 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .2200 |
| Elongation per inch under strain at elastic limit | do... | .002400 |
| Reduction in diameter at point of rupture | do... | .165 |
| Reduction in area after rupture, per cent of original section | | 54.6 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | .13, .34, .19 |

No. 6310.

Marks, A I R R 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002083 | .000333 | ..... | ..... | |
| 13,000 | 65,000 | .002200 | .000167 | ..... | ..... | Elastic limit. |
| 13,200 | 66,000 | .016667 | .014467 | ..... | ..... | |
| 13,400 | 67,000 | .017400 | .000733 | ..... | ..... | |
| 13,600 | 68,000 | .018600 | .001200 | ..... | ..... | |
| 14,000 | 70,000 | .020367 | .001767 | ..... | ..... | |
| 14,400 | 72,000 | .022333 | .001966 | ..... | ..... | |
| 15,200 | 76,000 | .027067 | .004734 | ..... | ..... | |
| 16,000 | 80,000 | .032167 | .005100 | ..... | ..... | |
| 16,800 | 84,000 | .037400 | .005233 | ..... | ..... | |
| 17,600 | 88,000 | .045000 | .007600 | ..... | ..... | |
| 18,400 | 92,000 | .053667 | .008667 | ..... | ..... | |
| 19,200 | 96,000 | .065667 | .012000 | ..... | ..... | |
| 20,420 | 102,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of orignal section | pounds.. | 102,100 |
| Elastic limit per square inch of original section | do... | 65,000 |
| Elongation per inch after rupture | inch.. | .2167 |
| Elongation per inch under strain at elastic limit | do... | .002200 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".12, ".33*, ".20 |

No. 6311.

Marks, A I R 2.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002400 | .000033 | ..... | ..... | |
| 14,400 | 72,000 | .002483 | .000083 | ..... | ..... | Elastic limit. |
| 14,600 | 73,000 | .014000 | .011567 | ..... | ..... | |
| 14,800 | 74,000 | .014667 | .000667 | ..... | ..... | |
| 15,000 | 75,000 | .015500 | .000833 | ..... | ..... | |
| 15,200 | 76,000 | .016333 | .000833 | ..... | ..... | |
| 15,600 | 78,000 | .017833 | .001500 | ..... | ..... | |
| 16,000 | 80,000 | .019833 | .002000 | ..... | ..... | |
| 16,800 | 84,000 | .022667 | .002834 | ..... | ..... | |
| 17,600 | 88,000 | .028333 | .005666 | ..... | ..... | |
| 18,400 | 92,000 | .033000 | .004667 | ..... | ..... | |
| 19,200 | 96,000 | .038333 | .005333 | ..... | ..... | |
| 20,000 | 100,000 | .045000 | .006667 | ..... | ..... | |
| 20,800 | 104,000 | .053333 | .008333 | ..... | ..... | |
| 22,600 | 113,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | ...pounds.. | 113,000 |
| Elastic limit per square inch of original section | ...do... | 72,000 |
| Elongation per inch after rupture | ...inch.. | .1967 |
| Elongation per inch under strain at elastic limit | ...do... | .002483 |
| Reduction in diameter at point of rupture | ...do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | $\frac{1}{2}$.13, $\frac{1}{4}$.33*, $\frac{1}{2}$.13 |

## No. 6312.

**Marks, A I R R 2.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000300 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000333 | ..... | ..... | |
| 15,000 | 75,000 | .002500 | .000167 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .022767 | .020267 | ..... | ..... | |
| 15,400 | 77,000 | .023833 | .001066 | ..... | ..... | |
| 15,600 | 78,000 | .025333 | .001500 | ..... | ..... | |
| 16,000 | 80,000 | .027167 | .001834 | ..... | ..... | |
| 16,800 | 84,000 | .032333 | .005166 | ..... | ..... | |
| 17,600 | 88,000 | .038000 | .005667 | ..... | ..... | |
| 18,400 | 92,000 | .044667 | .006667 | ..... | ..... | |
| 19,200 | 96,000 | .053833 | .009166 | ..... | ..... | |
| 20,000 | 100,000 | .065000 | .011167 | ..... | ..... | |
| 21,600 | 108,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 108,000 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .2133 |
| Elongation per inch under strain at elastic limit | do... | .002500 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1".29 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".29*, ".23*, ".12 |

## No. 6313.

Marks, A I R 3.
Diameter, ".505.
Sectional area .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 13,600 | 68,000 | .002267 | .000234 | ..... | ..... | |
| 13,800 | 69,000 | .002300 | .000033 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .019333 | .017033 | ..... | ..... | |
| 14,200 | 71,000 | .020433 | .001100 | ..... | ..... | |
| 14,400 | 72,000 | .021433 | .001000 | ..... | ..... | |
| 14,800 | 74,000 | .022833 | .001400 | ..... | ..... | |
| 15,200 | 76,000 | .026000 | .003167 | ..... | ..... | |
| 16,000 | 80,000 | .031000 | .005000 | ..... | ..... | |
| 16,800 | 84,000 | .037000 | .006000 | ..... | ..... | |
| 17,600 | 88,000 | .045000 | .008000 | ..... | ..... | |
| 18,400 | 92,000 | .054333 | .009333 | ..... | ..... | |
| 19,200 | 96,000 | .068000 | .013667 | ..... | ..... | |
| 20,000 | 100,000 | .095667 | .027667 | ..... | ..... | |
| 20,560 | 102,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 102,800 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .2367 |
| Elongation per inch under strain at elastic limit | do... | .002300 |
| Reduction in diameter at point of rupture | do... | .165 |
| Reduction in area after rupture, per cent of original section | | 54.6 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | .15, .40, .16 |

No. 6314.

*Marks, A I R R 3.*
*Diameter, ".505.*
*Sectional area, .20 square inch.*
*Gauged length, 3".*

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | | |
| 2,000 | 10,000 | .000233 | .000133 | | | |
| 4,000 | 20,000 | .000567 | .000334 | | | |
| 6,000 | 30,000 | .001000 | .000433 | | | |
| 8,000 | 40,000 | .001333 | .000333 | | | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | | |
| 12,000 | 60,000 | .002000 | .000333 | | | |
| 14,000 | 70,000 | .002333 | .000333 | | | Elastic limit. |
| 14,200 | 71,000 | .026667 | .024334 | | | |
| 14,400 | 72,000 | .027333 | .000666 | | | |
| 14,800 | 74,000 | .028333 | .001000 | | | |
| 15,200 | 76,000 | .030667 | .002334 | | | |
| 16,000 | 80,000 | .034333 | .003666 | | | |
| 16,800 | 84,000 | .041667 | .007334 | | | |
| 17,600 | 88,000 | .050733 | .009066 | | | |
| 18,400 | 92,000 | .062000 | .011267 | | | |
| 19,420 | 97,100 | .078000 | .016000 | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 97,100 |
| Elastic limit per square inch of original section | do... | 70,000 |
| Elongation per inch after rupture | inch.. | .2467 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".14, ".39, ".21 |

## No. 6317.

Marks, 78 U.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000367 | ..... | ..... | |
| 15,000 | 75,000 | .002533 | .000166 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .009333 | .006800 | ..... | ..... | |
| 15,400 | 77,000 | .010000 | .000667 | ..... | ..... | |
| 15,600 | 78,000 | .010333 | .000333 | ..... | ..... | |
| 16,000 | 80,000 | .011333 | .001000 | ..... | ..... | |
| 16,400 | 82,000 | .012267 | .000934 | ..... | ..... | |
| 16,800 | 84,000 | .013667 | .001400 | ..... | ..... | |
| 17,600 | 88,000 | .016667 | .003000 | ..... | ..... | |
| 18,400 | 92,000 | .019733 | .003066 | ..... | ..... | |
| 19,200 | 96,000 | .022667 | .002934 | ..... | ..... | |
| 20,000 | 100,000 | .026000 | .003333 | ..... | ..... | |
| 20,800 | 104,000 | .030000 | .004000 | ..... | ..... | |
| 21,600 | 108,000 | .034000 | .004000 | ..... | ..... | |
| 22,400 | 112,000 | .039333 | .005333 | ..... | ..... | |
| 23,200 | 116,000 | .046500 | .007167 | ..... | ..... | |
| 25,320 | 126,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 126,600 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1733 |
| Elongation per inch under strain at elastic limit | do... | .002533 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | $\frac{1}{2}$.10, $\frac{1}{2}$.30*, $\frac{1}{2}$.12 |

## No. 6318.

*Marks*, 78 U B.
*Diameter*, ".505.
*Sectional area*, .20 square inch.
*Gauged length*, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000834 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000966 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000834 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 13,600 | 68,000 | .002267 | .000267 | ..... | ..... | Elastic limit. |
| 13,800 | 69,000 | .021000 | .018733 | ..... | ..... | |
| 14,000 | 70,000 | .022833 | .001833 | ..... | ..... | |
| 14,200 | 71,000 | .023267 | .000934 | ..... | ..... | |
| 14,400 | 72,000 | .024333 | .001066 | ..... | ..... | |
| 14,800 | 74,000 | .026333 | .002000 | ..... | ..... | |
| 15,200 | 76,000 | .029333 | .003000 | ..... | ..... | |
| 15,600 | 78,000 | .032000 | .002667 | ..... | ..... | |
| 16,000 | 80,000 | .035167 | .003167 | ..... | ..... | |
| 16,800 | 84,000 | .042500 | .007333 | ..... | ..... | |
| 17,600 | 88,000 | .051667 | .009167 | ..... | ..... | |
| 18,400 | 92,000 | .062000 | .010333 | ..... | ..... | |
| 20,210 | 101,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 101,050 |
| Elastic limit per square inch of original section | do... | 68,000 |
| Elongation per inch after rupture | inch.. | .2133 |
| Elongation per inch under strain at elastic limit | do... | .002267 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | fine, silky, cup shaped |
| Elongation of inch sections | | ".84*, ".19, ".11 |

## No. 6337.

Marks, S.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000866 | ..... | ..... | Elastic limit. |
| | | .004200 | .001867 | ..... | ..... | |
| 14,200 | 71,000 | .004533 | .000333 | ..... | ..... | |
| 14,400 | 72,000 | .004967 | .000434 | ..... | ..... | |
| 14,600 | 73,000 | .005300 | .000333 | ..... | ..... | |
| 14,800 | 74,000 | .005767 | .000467 | ..... | ..... | |
| 15,200 | 76,000 | .007000 | .001233 | ..... | ..... | |
| 15,600 | 78,000 | .007833 | .000833 | ..... | ..... | |
| 16,000 | 80,000 | .008900 | .001067 | ..... | ..... | |
| 16,800 | 84,000 | .011067 | .002167 | ..... | ..... | |
| 17,600 | 88,000 | .013333 | .002266 | ..... | ..... | |
| 18,400 | 92,000 | .015700 | .002367 | ..... | ..... | |
| 19,200 | 96,000 | .018000 | .002300 | ..... | ..... | |
| 20,000 | 100,000 | .020700 | .002700 | ..... | ..... | |
| 26,410 | 132,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 132,050 |
| Elastic limit per square inch of original section | do... | 70,000 |
| Elongation per inch after rupture | inch.. | .1600 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".09, ".29*, ".10 |

## No. 6338.

*Marks*, C S.
*Diameter*, ".505.
*Sectional area*, .20 square inch.
*Gauged length*, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000867 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000300 | ..... | ..... | |
| 13,200 | 66,000 | .002233 | .000233 | ..... | ..... | Elastic limit. |
| 13,400 | 67,000 | .006667 | .004434 | ..... | ..... | |
| 13,600 | 68,000 | .007267 | .000600 | ..... | ..... | |
| 13,800 | 69,000 | .007667 | .000400 | ..... | ..... | |
| 14,000 | 70,000 | .008000 | .000333 | ..... | ..... | |
| 14,400 | 72,000 | .009233 | .001233 | ..... | ..... | |
| 14,800 | 74,000 | .010233 | .001000 | ..... | ..... | |
| 15,200 | 76,000 | .011333 | .001100 | ..... | ..... | |
| 15,600 | 78,000 | .012400 | .001067 | ..... | ..... | |
| 16,000 | 80,000 | .013567 | .001167 | ..... | ..... | |
| 16,800 | 84,000 | .016433 | .002866 | ..... | ..... | |
| 17,600 | 88,000 | .018667 | .002234 | ..... | ..... | |
| 18,400 | 92,000 | .021700 | .003033 | ..... | ..... | |
| 19,200 | 96,000 | .024333 | .002633 | ..... | ..... | |
| 20,000 | 100,000 | .028000 | .003667 | ..... | ..... | |
| 25,100 | 125,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 125,500 |
| Elastic limit per square inch of original section | do... | 66,000 |
| Elongation per inch after rupture | inch.. | .1600 |
| Elongation per inch under strain at elastic limit | do... | .002233 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".48 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".11, ".27*, ".10 |

## No. 6339.

Marks, S ✠
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001733 | .000366 | .000033 | .000033 | |
| 12,000 | 60,000 | .002033 | .000300 | ..... | ..... | |
| 13,800 | 69,000 | .002367 | .000334 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .003933 | .001566 | ..... | ..... | |
| 14,200 | 71,000 | .004267 | .000334 | ..... | ..... | |
| 14,400 | 72,000 | .004633 | .000366 | ..... | ..... | |
| 14,600 | 73,000 | .005000 | .000367 | ..... | ..... | |
| 14,800 | 74,000 | .005433 | .000433 | ..... | ..... | |
| 15,200 | 76,000 | .006333 | .000900 | ..... | ..... | |
| 15,600 | 78,000 | .007300 | .000967 | ..... | ..... | |
| 16,000 | 80,000 | .008667 | .001367 | ..... | ..... | |
| 16,800 | 84,000 | .010100 | .001433 | ..... | ..... | |
| 17,600 | 88,000 | .012667 | .002567 | ..... | ..... | |
| 18,400 | 92,000 | .015167 | .002500 | ..... | ..... | |
| 19,200 | 96,000 | .017533 | .002366 | ..... | ..... | |
| 20,000 | 100,000 | .020333 | .002800 | ..... | ..... | |
| 26,730 | 133,650 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 133,650 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .002367 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1″.44 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ″.09, ″.28, ″.12 |

## No. 6340.

*Marks*, S S ✠.
*Diameter*, ".505.
*Sectional area*, .20 square inch.
*Gauged length*, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000367 | ..... | ..... | |
| 14,000 | 70,000 | .002433 | .000366 | ..... | ..... | Elastic limit. |
| 14,200 | 71,000 | .002533 | .000100 | ..... | ..... | |
| 14,400 | 72,000 | .003000 | .000467 | ..... | ..... | |
| 14,600 | 73,000 | .004600 | .001600 | ..... | ..... | |
| 14,800 | 74,000 | .005033 | .000433 | ..... | ..... | |
| 15,000 | 75,000 | .005500 | .000467 | ..... | ..... | |
| 15,200 | 76,000 | .005933 | .000433 | ..... | ..... | |
| 15,600 | 78,000 | .006900 | .000967 | ..... | ..... | |
| 16,000 | 80,000 | .008000 | .001100 | ..... | ..... | |
| 16,800 | 84,000 | .010000 | .002000 | ..... | ..... | |
| 17,600 | 88,000 | .012667 | .002667 | ..... | ..... | |
| 18,400 | 92,000 | .014500 | .001833 | ..... | ..... | |
| 19,200 | 96,000 | .017333 | .002833 | ..... | ..... | |
| 20,000 | 100,000 | .019667 | .002334 | ..... | ..... | |
| 26,710 | 133,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 133,550 |
| Elastic limit per square inch of original section | do... | 70,000 |
| Elongation per inch after rupture | inch.. | .1467 |
| Elongation per inch under strain at elastic limit | do... | .002433 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1."06 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".23", ".14", .07 |

## Barrel Steel, Annealed in Charcoal.

### No. 6357.

Marks, S C ✠.
Diameter ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000300 | 0. | ..... | |
| 10,200 | 51,000 | .001667 | .000034 | ..... | ..... | |
| 10,400 | 52,000 | .001700 | .000033 | ..... | ..... | |
| 10,600 | 53,000 | .001733 | .000033 | ..... | ..... | |
| 10,800 | 54,000 | .001767 | .000034 | ..... | ..... | Elastic limit. |
| 11,000 | 55,000 | .006333 | .004566 | ..... | ..... | |
| 11,200 | 56,000 | .007000 | .000667 | ..... | ..... | |
| 11,600 | 58,000 | .007833 | .000833 | ..... | ..... | |
| 12,000 | 60,000 | .009067 | .001234 | ..... | ..... | |
| 12,400 | 62,000 | .010167 | .001100 | ..... | ..... | |
| 12,800 | 64,000 | .011233 | .001066 | ..... | ..... | |
| 13,600 | 68,000 | .014367 | .003134 | ..... | ..... | |
| 14,400 | 72,000 | .016333 | .001966 | ..... | ..... | |
| 15,200 | 76,000 | .018667 | .002334 | ..... | ..... | |
| 16,000 | 80,000 | .021333 | .002666 | ..... | ..... | |
| 16,800 | 84,000 | .025600 | .004267 | ..... | ..... | |
| 17,600 | 88,000 | .028900 | .003300 | ..... | ..... | |
| 18,400 | 92,000 | .033167 | .004267 | ..... | ..... | |
| 19,200 | 96,000 | .037400 | .004233 | ..... | ..... | |
| 20,000 | 100,000 | .043333 | .005933 | ..... | ..... | |
| 22,600 | 113,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 113,000 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .001767 |
| Reduction in diameter at point of rupture | do... | .144 |
| Reduction in area after rupture, per cent of original section | | 44.6 |
| Position of rupture | | 1".4 from neck |
| Character of broken surface | | silky, interspersed with fine granulation |
| Elongation of inch sections | | ".13, ".23, ".11 |

## HOLLOW SPECIMEN FROM BUTT OF BARREL AFTER SPECIAL TREATMENT.

### No. 6369.

Marks, S O.
Exterior diameter, ".588.
Interior diameter, ".295.
Sectional area, .203 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 203 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,015 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,030 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,060 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,090 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,120 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 8,323 | 41,000 | .001400 | .000067 | ..... | ..... | |
| 8,526 | 42,000 | .001467 | .000067 | ..... | ..... | |
| 8,729 | 43,000 | .001567 | .000100 | ..... | ..... | Elastic limit not well defined. |
| 8,932 | 44,000 | .001733 | .000166 | ..... | ..... | |
| 9,135 | 45,000 | .001933 | .000200 | ..... | ..... | |
| 9,338 | 46,000 | .002100 | .000167 | ..... | ..... | |
| 9,541 | 47,000 | .002267 | .000267 | ..... | ..... | |
| 9,744 | 48,000 | .003333 | .001466 | ..... | ..... | |
| 9,947 | 49,000 | .004433 | .001100 | ..... | ..... | |
| 10,150 | 50,000 | .005300 | .000867 | .003333 | .003333 | |
| 10,556 | 52,000 | .006667 | .001367 | ..... | ..... | |
| 10,962 | 54,000 | .007667 | .001000 | ..... | ..... | |
| 11,368 | 56,000 | .008667 | .001000 | ..... | ..... | |
| 11,774 | 58,000 | .010067 | .001400 | ..... | ..... | |
| 12,180 | 60,000 | .011000 | .000933 | ..... | ..... | |
| 12,992 | 64,000 | .013400 | .002400 | ..... | ..... | |
| 13,804 | 68,000 | .016033 | .002633 | ..... | ..... | |
| 14,616 | 72,000 | .019067 | .003034 | ..... | ..... | |
| 15,428 | 76,000 | .021700 | .002633 | ..... | ..... | |
| 16,240 | 80,000 | .025633 | .003933 | ..... | ..... | |
| 17,052 | 84,000 | .029333 | .003700 | ..... | ..... | |
| 17,864 | 88,000 | .033733 | .004400 | ..... | ..... | |
| 18,676 | 92,000 | .039267 | .005534 | ..... | ..... | |
| 19,488 | 96,000 | .045333 | .006066 | ..... | ..... | |
| 20,300 | 100,000 | .054667 | .009334 | ..... | ..... | |
| 21,980 | 108,280 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 108,280 |
| Elastic limit per square inch of original section, not well defined | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .1633 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture (exterior) | do... | .078 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | granular 85 per cent, silky 15 per cent |
| Elongation of inch sections | | ".11, ".25*, ".18 |

## ROLLED BARREL ANNEALED IN CHARCOAL.

### No. 6378.

Marks, S C L.
Diameter, ".505.
Sectional area, .30 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | ..... | ..... | |
| 11,000 | 55,000 | .001833 | .000133 | ..... | ..... | |
| 11,200 | 56,000 | .001900 | .000067 | ..... | ..... | Elastic limit. |
| 11,400 | 57,000 | .003667 | .001767 | ..... | ..... | |
| 11,600 | 58,000 | .005667 | .002000 | ..... | ..... | |
| 11,800 | 59,000 | .007067 | .001400 | ..... | ..... | |
| 12,000 | 60,000 | .007733 | .000666 | ..... | ..... | |
| 12,400 | 62,000 | .009367 | .001634 | ..... | ..... | |
| 12,800 | 64,000 | .010333 | .000966 | ..... | ..... | |
| 13,600 | 68,000 | .012867 | .002534 | ..... | ..... | |
| 14,400 | 72,000 | .014667 | .001800 | ..... | ..... | |
| 15,200 | 76,000 | .017867 | .003200 | ..... | ..... | |
| 16,000 | 80,000 | .020100 | .002233 | ..... | ..... | |
| 16,800 | 84,000 | .023000 | .002900 | ..... | ..... | |
| 17,600 | 88,000 | .027000 | .004000 | ..... | ..... | |
| 18,400 | 92,000 | .030767 | .003767 | ..... | ..... | |
| 19,200 | 96,000 | .035067 | .004300 | ..... | ..... | |
| 20,000 | 100,000 | .040833 | .005766 | ..... | ..... | |
| 22,790 | 113,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 113,950 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .1600 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | $^{a}$.85 from neck |
| Character of broken surface | | silky, interspersed with fine granulations |
| Elongation of inch sections | | $^{a}$.09, $^{a}$.13, $^{a}$.26$^{a}$ |

## ROLLED BARREL ANNEALED IN LIME.

### No. 6374.

Marks, S L.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | 0. | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 12,200 | 61,000 | .002067 | .000034 | ..... | ..... | |
| 12,400 | 62,000 | .002100 | .000033 | ..... | ..... | Elastic limit. |
| 12,600 | 63,000 | .003500 | .001400 | ..... | ..... | |
| 12,800 | 64,000 | .003733 | .000233 | ..... | ..... | |
| 13,000 | 65,000 | .004267 | .000534 | ..... | ..... | |
| 13,200 | 66,000 | .004667 | .000400 | ..... | ..... | |
| 13,600 | 68,000 | .005367 | .000700 | ..... | ..... | |
| 14,000 | 70,000 | .006533 | .001166 | ..... | ..... | |
| 14,400 | 72,000 | .007333 | .000800 | ..... | ..... | |
| 15,200 | 76,000 | .009567 | .002234 | ..... | ..... | |
| 16,000 | 80,000 | .011667 | .002100 | ..... | ..... | |
| 16,800 | 84,000 | .013833 | .002166 | ..... | ..... | |
| 17,600 | 88,000 | .016300 | .002467 | ..... | ..... | |
| 18,400 | 92,000 | .019000 | .002700 | ..... | ..... | |
| 19,200 | 96,000 | .022000 | .003000 | ..... | ..... | |
| 20,000 | 100,000 | .024667 | .002667 | ..... | ..... | |
| 25,570 | 127,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 127,850 |
| Elastic limit per square inch of original section | do... | 62,000 |
| Elongation per inch after rupture | inch.. | .18333 |
| Elongation per inch under strain at elastic limit | do... | .002100 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky center, fine granular at the circumference |
| Elongation of inch sections | | ".08, ".22*, ".10 |

## ROLLED BARREL ANNEALED IN SAND.

### No. 6375.

Marks, S S S.
Diameter ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | ..... | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 10,000 | 50,000 | .001700 | .000366 | ..... | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 12,200 | 61,000 | .002100 | .000067 | ..... | ..... | |
| 12,400 | 62,000 | .002167 | .000067 | ..... | ..... | |
| 12,600 | 63,000 | .002233 | .000066 | ..... | ..... | |
| 12,800 | 64,000 | .002300 | .000067 | ..... | ..... | |
| 13,000 | 65,000 | .002333 | .000033 | ..... | ..... | Elastic limit. |
| 13,200 | 66,000 | .002933 | .000600 | ..... | ..... | |
| 13,400 | 67,000 | .003300 | .000367 | ..... | ..... | |
| 13,600 | 68,000 | .005000 | .001700 | ..... | ..... | |
| 13,800 | 69,000 | .005267 | .000267 | ..... | ..... | |
| 14,000 | 70,000 | .005700 | .000433 | ..... | ..... | |
| 14,400 | 72,000 | .006667 | .000967 | ..... | ..... | |
| 15,200 | 76,000 | .009000 | .002333 | ..... | ..... | |
| 16,000 | 80,000 | .010900 | .001900 | ..... | ..... | |
| 16,800 | 84,000 | .013333 | .002433 | ..... | ..... | |
| 17,600 | 88,000 | .015667 | .002334 | ..... | ..... | |
| 18,400 | 92,000 | .018033 | .002366 | ..... | ..... | |
| 19,200 | 96,000 | .021100 | .003067 | ..... | ..... | |
| 20,000 | 100,000 | .024000 | .002900 | ..... | ..... | |
| 25,620 | 128,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 128,100 |
| Elastic limit per square inch of original section | do... | 65,000 |
| Elongation per inch after rupture | inch.. | .1433 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ".06 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".07, ".16, ".20 |

## No. 6377.

Marks, A $B_1$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000334 | ..... | ..... | |
| 14,200 | 71,000 | .002433 | .000066 | ..... | ..... | |
| 14,400 | 72,000 | .002500 | .000067 | ..... | ..... | Elastic limit. |
| 14,600 | 73,000 | .014333 | .011833 | ..... | ..... | |
| 14,800 | 74,000 | .015000 | .000667 | ..... | ..... | |
| 15,000 | 75,000 | .015700 | .000700 | ..... | ..... | |
| 15,200 | 76,000 | .016667 | .000967 | ..... | ..... | |
| 15,600 | 78,000 | .018333 | .001666 | ..... | ..... | |
| 16,000 | 80,000 | .020167 | .001834 | ..... | ..... | |
| 16,800 | 84,000 | .024000 | .003833 | ..... | ..... | |
| 17,600 | 88,000 | .028333 | .004333 | ..... | ..... | |
| 18,400 | 92,000 | .033067 | .004734 | ..... | ..... | |
| 19,200 | 96,000 | .038333 | .005266 | ..... | ..... | |
| 20,000 | 100,000 | .045333 | .007000 | ..... | ..... | |
| 22,700 | 113,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 113,500 |
| Elastic limit per square inch of original section | do... | 72,000 |
| Elongation per inch after rupture | inch.. | .1933 |
| Elongation per inch under strain at elastic limit | do... | .002500 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".55 from neck |
| Character of broken surface | | fine silky, with trace of granulation |
| Elongation of inch sections | | ".14, ".31*, ".18 |

## No. 6378.

Marks A $B_2$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 14,000 | 70,000 | .002400 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002467 | .000067 | ..... | ..... | |
| 14,400 | 72,000 | .002533 | .000066 | ..... | ..... | |
| 14,600 | 73,000 | .002600 | .000067 | ..... | ..... | |
| 14,800 | 74,000 | .002633 | .000033 | ..... | ..... | Elastic limit. |
| 15,000 | 75,000 | .012333 | .009700 | ..... | ..... | |
| 15,200 | 76,000 | .012933 | .000600 | ..... | ..... | |
| 15,600 | 78,000 | .014000 | .001067 | ..... | ..... | |
| 16,000 | 80,000 | .015667 | .001667 | ..... | ..... | |
| 16,800 | 84,000 | .019000 | .003333 | ..... | ..... | |
| 17,600 | 88,000 | .022733 | .003733 | ..... | ..... | |
| 18,400 | 92,000 | .026333 | .003600 | ..... | ..... | |
| 19,200 | 96,000 | .030667 | .004334 | ..... | ..... | |
| 20,000 | 100,000 | .035333 | .004666 | ..... | ..... | |
| 20,800 | 104,000 | .040167 | .004834 | ..... | ..... | |
| 21,600 | 108,000 | .047333 | .007166 | ..... | ..... | |
| 23,890 | 119,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 119,450 |
| Elastic limit per square inch of original section | do... | 74,000 |
| Elongation per inch after rupture | inch.. | .1733 |
| Elongation per inch under strain at elastic limit | do... | .002633 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | fine, silky, trace of granulation |
| Elongation of inch sections | | ".25", ".15, ".11 |

No. 6379.

**Marks, A $G_1$.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000367 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000367 | ..... | ..... | |
| 14,200 | 71,000 | .002433 | .000066 | ..... | ..... | |
| 14,400 | 72,000 | .002500 | .000067 | ..... | ..... | Elastic limit. |
| 14,600 | 73,000 | .014500 | .012000 | ..... | ..... | |
| 14,800 | 74,000 | .015500 | .001000 | ..... | ..... | |
| 15,000 | 75,000 | .016000 | .000500 | ..... | ..... | |
| 15,200 | 76,000 | .016900 | .000900 | ..... | ..... | |
| 15,600 | 78,000 | .018333 | .001433 | ..... | ..... | |
| 16,000 | 80,000 | .020500 | .002167 | ..... | ..... | |
| 16,800 | 84,000 | .024167 | .003667 | ..... | ..... | |
| 17,600 | 88,000 | .028167 | .004000 | ..... | ..... | |
| 18,400 | 92,000 | .033667 | .005500 | ..... | ..... | |
| 19,200 | 96,000 | .039667 | .006000 | ..... | ..... | |
| 20,000 | 100,000 | .046667 | .007000 | ..... | ..... | |
| 22,490 | 112,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,450 |
| Elastic limit per square inch of original section | do... | 72,000 |
| Elongation per inch after rupture | inch.. | .2800 |
| Elongation per inch under strain at elastic limit | do... | .002500 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine silky, trace of granulation |
| Elongation of inch sections | | ".12, ".34*, ".14 |

No. 6380.

Marks, A G 2.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000334 | ..... | ..... | |
| 14,200 | 71,000 | .002433 | .000066 | ..... | ..... | |
| 14,400 | 72,000 | .002500 | .000067 | ..... | ..... | |
| 14,600 | 73,000 | .002533 | .000033 | ..... | ..... | |
| 14,800 | 74,000 | .002567 | .000034 | ..... | ..... | |
| 15,000 | 75,000 | .002633 | .000066 | ..... | ..... | |
| 15,200 | 76,000 | .002667 | .000034 | ..... | ..... | |
| 15,400 | 77,000 | .002700 | .000033 | ..... | ..... | Elastic limit. |
| | | .005667 | .002967 | ..... | ..... | |
| 15,600 | 78,000 | .008333 | .002666 | ..... | ..... | |
| 15,800 | 79,000 | .008700 | .000367 | ..... | ..... | |
| 16,000 | 80,000 | .009367 | .000667 | ..... | ..... | |
| 16,400 | 82,000 | .010400 | .001033 | ..... | ..... | |
| 16,800 | 84,000 | .012000 | .001600 | ..... | ..... | |
| 17,600 | 88,000 | .015000 | .003000 | ..... | ..... | |
| 18,400 | 92,000 | .017667 | .002667 | ..... | ..... | |
| 19,200 | 96,000 | .020500 | .002833 | ..... | ..... | |
| 20,000 | 100,000 | .023333 | .002833 | ..... | ..... | |
| 20,800 | 104,000 | .027000 | .003667 | ..... | ..... | |
| 21,600 | 108,000 | .031333 | .004333 | ..... | ..... | |
| 22,400 | 112,000 | .038500 | .007167 | ..... | ..... | |
| 23,200 | 116,000 | .041000 | .002500 | ..... | ..... | |
| 26,020 | 130,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 130,100 |
| Elastic limit per square inch of original section | do... | 77,000 |
| Elongation per inch after rupture | inch.. | .1433 |
| Elongation per inch under strain at elastic limit | do... | .002700 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | 1".06 from neck |
| Character of broken surface | | fine silky, interspersed with granular metal |
| Elongation of inch sections | | ".20", ".14, ".09 |

No. 6381.

*Marks A B 1, R.*
*Diameter, ".505.*
*Sectional area, .20 square inch.*
*Gauged length, 3".*

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 5. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | | |
| 2,000 | 10,000 | .000300 | .000167 | | | |
| 4,000 | 20,000 | .000633 | .000333 | | | |
| 6,000 | 30,000 | .000967 | .000334 | | | |
| 8,000 | 40,000 | .001333 | .000366 | | | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | | |
| 12,000 | 60,000 | .002033 | .000366 | | | |
| 13,000 | 65,000 | .002267 | .000234 | | | Elastic limit. |
| 13,200 | 66,000 | .014333 | .012066 | | | |
| 13,400 | 67,000 | .015267 | .000934 | | | |
| 13,600 | 68,000 | .016167 | .000900 | | | |
| 14,000 | 70,000 | .018400 | .002233 | | | |
| 14,400 | 72,000 | .019500 | .001100 | | | |
| 15,200 | 76,000 | .022333 | .003833 | | | |
| 16,000 | 80,000 | .028667 | .006334 | | | |
| 16,800 | 84,000 | .033433 | .004766 | | | |
| 17,600 | 88,000 | .038333 | .004900 | | | |
| 18,400 | 92,000 | .045000 | .006667 | | | |
| 19,200 | 96,000 | .054667 | .009667 | | | |
| 21,190 | 105,950 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 105,950 |
| Elastic limit per square inch of original section | do... | 65,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002267 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".06 from neck |
| Character of broken surface | | fine silky, trace of granulation |
| Elongation of inch sections | | ".12, ".19, ".29 |

No. 6382.

Marks, A B 2, R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 12,800 | 64,000 | .002167 | .000167 | ..... | ..... | |
| 13,000 | 65,000 | .002200 | .000033 | ..... | ..... | |
| 13,200 | 66,000 | .002233 | .000033 | ..... | ..... | Elastic limit. |
| 13,400 | 67,000 | .012333 | .010100 | ..... | ..... | |
| 13,600 | 68,000 | .013300 | .000967 | ..... | ..... | |
| 13,800 | 69,000 | .013733 | .000433 | ..... | ..... | |
| 14,000 | 70,000 | .014333 | .000600 | ..... | ..... | |
| 14,400 | 72,000 | .015667 | .001334 | ..... | ..... | |
| 15,200 | 76,000 | .018667 | .003000 | ..... | ..... | |
| 16,000 | 80,000 | .022667 | .004000 | ..... | ..... | |
| 16,800 | 84,000 | .027000 | .004333 | ..... | ..... | |
| 17,600 | 88,000 | .031467 | .004167 | ..... | ..... | |
| 18,400 | 92,000 | .036000 | .004333 | ..... | ..... | |
| 19,200 | 96,000 | .041333 | .005333 | ..... | ..... | |
| 20,000 | 100,000 | .050333 | .008500 | ..... | ..... | |
| 22,250 | 111,250 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 111,250 |
| Elastic limit per square inch of original section | do... | 66,000 |
| Elongation per inch after rupture | inch.. | .1533 |
| Elongation per inch under strain at elastic limit | do... | .002233 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | ".60 from neck |
| Character of broken surface | | fine silky, trace of granulation |
| Elongation of inch sections | | ".25, ".11, ".10 |

## No. 6383.

**Marks, A $G_1$, R.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 12,200 | 61,000 | .002100 | .000067 | ..... | ..... | Elastic limit. |
| 12,400 | 62,000 | .010333 | .008233 | ..... | ..... | |
| 12,600 | 63,000 | .011233 | .000900 | ..... | ..... | |
| 12,800 | 64,000 | .011667 | .000434 | ..... | ..... | |
| 13,200 | 66,000 | .013333 | .001666 | ..... | ..... | |
| 13,600 | 68,000 | .014667 | .001334 | ..... | ..... | |
| 14,400 | 72,000 | .018500 | .003833 | ..... | ..... | |
| 15,200 | 76,000 | .022000 | .003500 | ..... | ..... | |
| 16,000 | 80,000 | .025767 | .003767 | ..... | ..... | |
| 16,800 | 84,000 | .031000 | .005233 | ..... | ..... | |
| 17,600 | 88,000 | .036167 | .005167 | ..... | ..... | |
| 18,400 | 92,000 | .043000 | .006833 | ..... | ..... | |
| 19,200 | 96,000 | .056667 | .013667 | ..... | ..... | |
| 21,480 | 107,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 107,400 |
| Elastic limit per square inch of original section | do... | 61,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .002100 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.8 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".12, ".32*, ".16 |

## No. 6384.

Marks, A $G_3$, R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .001333 | ..... | ..... | |
| 13,600 | 68,000 | .002300 | .000300 | ..... | ..... | |
| 13,800 | 69,000 | .002333 | .000033 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .009000 | .006667 | ..... | ..... | |
| 14,200 | 71,000 | .009667 | .000667 | ..... | ..... | |
| 14,400 | 72,000 | .010267 | .000700 | ..... | ..... | |
| 14,800 | 74,000 | .011333 | .001166 | ..... | ..... | |
| 15,600 | 78,000 | .014167 | .002834 | ..... | ..... | |
| 16,400 | 82,000 | .017167 | .003000 | ..... | ..... | |
| 17,200 | 86,000 | .019833 | .002666 | ..... | ..... | |
| 18,000 | 90,000 | .023000 | .003167 | ..... | ..... | |
| 18,800 | 94,000 | .026667 | .003667 | ..... | ..... | |
| 19,200 | 96,000 | .028500 | .001833 | ..... | ..... | |
| 20,000 | 100,000 | .033667 | .005167 | ..... | ..... | |
| 20,800 | 104,000 | .037333 | .003666 | ..... | ..... | |
| 21,600 | 108,000 | .043333 | .006000 | ..... | ..... | |
| 22,400 | 112,000 | .051333 | .008000 | ..... | ..... | |
| 24,270 | 121,350 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 121,350 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .1467 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | at middle of the stem |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ".10, ".23, ".11 |

## No. 6385.

*Hollow* specimen.
Marks, *J* X.
*Exterior* diameter, ".588.
*Interior* diameter, ".300.
*Sectional* area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 11,000 | 55,000 | .001800 | .000167 | ..... | ..... | |
| 11,200 | 56,000 | .001867 | .000067 | ..... | ..... | |
| 11,400 | 57,000 | .001900 | .000033 | ..... | ..... | |
| 11,600 | 58,000 | .001967 | .000067 | ..... | ..... | |
| 11,800 | 59,000 | .002033 | .000066 | ..... | ..... | Elastic limit. |
| 12,000 | 60,000 | .003967 | .001934 | ..... | ..... | |
| 12,200 | 61,000 | .004400 | .000433 | ..... | ..... | |
| 12,400 | 62,000 | .004700 | .000300 | ..... | ..... | |
| 12,600 | 63,000 | .005100 | .000400 | ..... | ..... | |
| 12,800 | 64,000 | .005667 | .000567 | ..... | ..... | |
| 13,200 | 66,000 | .006367 | .000700 | ..... | ..... | |
| 13,600 | 68,000 | .007300 | .000933 | ..... | ..... | |
| 14,400 | 72,000 | .009167 | .001867 | ..... | ..... | |
| 15,200 | 76,000 | .011400 | .002233 | ..... | ..... | |
| 16,000 | 80,000 | .013333 | .001933 | ..... | ..... | |
| 16,800 | 84,000 | .015667 | .002334 | ..... | ..... | |
| 17,600 | 88,000 | .018167 | .002500 | ..... | ..... | |
| 18,400 | 92,000 | .020833 | .002666 | ..... | ..... | |
| 19,200 | 96,000 | .023500 | .002667 | ..... | ..... | |
| 20,000 | 100,000 | .026667 | .003167 | ..... | ..... | |
| 20,800 | 104,000 | .030000 | .003333 | ..... | ..... | |
| 21,600 | 108,000 | .034333 | .004333 | ..... | ..... | |
| 22,400 | 112,000 | .039333 | .005000 | ..... | ..... | |
| 23,200 | 116,000 | .045333 | .006000 | ..... | ..... | |
| 25,280 | 126,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 126,400 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .1233 |
| Elongation per inch under strain at elastic limit | do... | .002033 |
| Reduction in diameter at point of rupture (exterior) | do... | .068 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | fine, granular |
| Elongation of inch sections | | ".09, ".11, ".17* |

## Open Hearth Stock, Lime Annealed in Furnace after Cooling from Rolling Heat.

### No. 6390.

Marks, L B from breech.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000367 | 0. | ..... | |
| 10,400 | 52,000 | .001767 | .000100 | ..... | ..... | |
| 10,600 | 53,000 | .001800 | .000033 | ..... | ..... | |
| 10,800 | 54,000 | .001867 | .000067 | ..... | ..... | Elastic limit. |
| 11,000 | 55,000 | .004867 | .003000 | ..... | ..... | |
| 11,200 | 56,000 | .006033 | .001166 | ..... | ..... | |
| 11,400 | 57,000 | .006567 | .000534 | ..... | ..... | |
| 11,600 | 58,000 | .006933 | .000366 | ..... | ..... | |
| 12,000 | 60,000 | .008100 | .001167 | ..... | ..... | |
| 12,400 | 62,000 | .009333 | .001233 | ..... | ..... | |
| 12,800 | 64,000 | .010667 | .001334 | ..... | ..... | |
| 13,600 | 68,000 | .013333 | .002666 | ..... | ..... | |
| 14,400 | 72,000 | .016000 | .002667 | ..... | ..... | |
| 15,200 | 76,000 | .019033 | .003033 | ..... | ..... | |
| 16,000 | 80,000 | .022333 | .003300 | ..... | ..... | |
| 16,800 | 84,000 | .026000 | .003667 | ..... | ..... | |
| 17,600 | 88,000 | .030400 | .004400 | ..... | ..... | |
| 18,400 | 92,000 | .036000 | .005600 | ..... | ..... | |
| 19,200 | 96,000 | .042733 | .006733 | ..... | ..... | |
| 20,000 | 100,000 | .051000 | .008267 | ..... | ..... | |
| 22,010 | 110,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 110,050 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .1767 |
| Elongation per inch under strain at elastic limit | do... | .001867 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".10, ".10, ".89 |

## No. 6391.

Marks, L. M. from muzzle.
Diameter, ".505.
Sectional area, .20 square inch.
Guaged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000867 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000833 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000833 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000834 | 0. | ..... | |
| 11,000 | 55,000 | .001900 | .000233 | ..... | ..... | |
| 12,000 | 60,000 | .002083 | .000183 | ..... | ..... | |
| 12,200 | 61,000 | .002067 | .000084 | ..... | ..... | Elastic limit. |
| 12,400 | 62,000 | .005267 | .003200 | ..... | ..... | |
| 12,600 | 63,000 | .005567 | .000300 | ..... | ..... | |
| 12,800 | 64,000 | .006100 | .000533 | ..... | ..... | |
| 13,200 | 66,000 | .007333 | .001233 | ..... | ..... | |
| 13,600 | 68,000 | .008167 | .000834 | ..... | ..... | |
| 14,400 | 72,000 | .011100 | .002933 | ..... | ..... | |
| 15,200 | 76,000 | .013000 | .001900 | ..... | ..... | |
| 16,000 | 80,000 | .015667 | .002667 | ..... | ..... | |
| 16,800 | 84,000 | .018500 | .002833 | ..... | ..... | |
| 17,600 | 88,000 | .021333 | .002833 | ..... | ..... | |
| 18,400 | 92,000 | .024667 | .003334 | ..... | ..... | |
| 19,200 | 96,000 | .028000 | .003333 | ..... | ..... | |
| 20,000 | 100,000 | .032167 | .004167 | ..... | ..... | |
| 20,800 | 104,000 | .036667 | .004500 | ..... | ..... | |
| 21,600 | 108,000 | .043000 | .006333 | ..... | ..... | |
| 23,940 | 119,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 119,700 |
| Elastic limit per square inch of original section | do... | 61,000 |
| Elongation per inch after rupture | inch.. | .1867 |
| Elongation per inch under strain at elastic limit | do... | .002067 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".18 from neck |
| Character of broken surface | | silky, trace of fine granulation; partial fracture of stem at center punch mark, defining inch sections on surface of stem. |
| Elongation of inch sections | | ".18*, ".27*, ".11 |

## Rolled Barrel Steel.

### No. 6397.

Marks, S X M from muzzle.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000333 | ..... | ..... | |
| 14,200 | 71,000 | .002367 | .000034 | ..... | ..... | Elastic limit. |
| 14,400 | 72,000 | .013583 | .011166 | ..... | ..... | |
| 14,600 | 73,000 | .014000 | .000467 | ..... | ..... | |
| 14,800 | 74,000 | .014667 | .000667 | ..... | ..... | |
| 15,000 | 75,000 | .015333 | .000666 | ..... | ..... | |
| 15,200 | 76,000 | .016267 | .000934 | ..... | ..... | |
| 15,600 | 78,000 | .017667 | .001400 | ..... | ..... | |
| 16,000 | 80,000 | .019333 | .001666 | ..... | ..... | |
| 16,800 | 84,000 | .022933 | .003600 | ..... | ..... | |
| 17,600 | 88,000 | .027333 | .004400 | ..... | ..... | |
| 18,400 | 92,000 | .031500 | .004167 | ..... | ..... | |
| 19,200 | 96,000 | .036333 | .004833 | ..... | ..... | |
| 20,000 | 100,000 | .043333 | .007000 | ..... | ..... | |
| 22,910 | 114,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 114,550 |
| Elastic limit per square inch of original section | do... | 71,000 |
| Elongation per inch after rupture | inch.. | .1867 |
| Elongation per inch under strain at elastic limit | do... | .002367 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".21 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".13, ".22*, ".21* |

## No. 6398.

**Marks, S X B, from breech.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 13,000 | 65,000 | .002233 | .000233 | ..... | ..... | |
| 13,200 | 66,000 | .002267 | .000034 | ..... | ..... | |
| 13,400 | 67,000 | .002300 | .000033 | ..... | ..... | Elastic limit. |
| 13,600 | 68,000 | .015867 | .013567 | ..... | ..... | |
| 13,800 | 69,000 | .016667 | .001300 | ..... | ..... | |
| 14,000 | 70,000 | .017267 | .000600 | ..... | ..... | |
| 14,400 | 72,000 | .018333 | .001066 | ..... | ..... | |
| 14,800 | 74,000 | .019667 | .001334 | ..... | ..... | |
| 15,200 | 76,000 | .021667 | .002000 | ..... | ..... | |
| 16,000 | 80,000 | .025000 | .004333 | ..... | ..... | |
| 16,800 | 84,000 | .029767 | .003767 | ..... | ..... | |
| 17,600 | 88,000 | .034667 | .004900 | ..... | ..... | |
| 18,400 | 92,000 | .040000 | .005333 | ..... | ..... | |
| 19,200 | 96,000 | .047667 | .007667 | ..... | ..... | |
| 20,000 | 100,000 | .056333 | .010666 | ..... | ..... | |
| 22,000 | 110,150 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 110,150 |
| Elastic limit per square inch of original section | do... | 67,000 |
| Elongation per inch after rupture | inch.. | .1833 |
| Elongation per inch under strain at elastic limit | do... | .002300 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".14, ".30", ".11 |

## No. 6399.

Marks, S.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001633 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .001967 | .000334 | ..... | ..... | |
| 14,000 | 70,000 | .002333 | .000366 | ..... | ..... | |
| 14,200 | 71,000 | .002367 | .000034 | ..... | ..... | |
| 14,400 | 72,000 | .002400 | .000033 | ..... | ..... | Elastic limit. |
| 14,600 | 73,000 | .005500 | .003100 | ..... | ..... | |
| 14,800 | 74,000 | .005967 | .000467 | ..... | ..... | |
| 15,000 | 75,000 | .006600 | .000633 | ..... | ..... | |
| 15,200 | 76,000 | .007000 | .000400 | ..... | ..... | |
| 15,600 | 78,000 | .008067 | .001067 | ..... | ..... | |
| 16,000 | 80,000 | .009100 | .001033 | ..... | ..... | |
| 16,800 | 84,000 | .011333 | .002233 | ..... | ..... | |
| 17,600 | 88,000 | .013667 | .002334 | ..... | ..... | |
| 18,400 | 92,000 | .016333 | .002666 | ..... | ..... | |
| 19,200 | 96,000 | .019033 | .002700 | ..... | ..... | |
| 20,000 | 100,000 | .021600 | .002567 | ..... | ..... | |
| 20,800 | 104,000 | .024833 | .003233 | ..... | ..... | |
| 21,600 | 108,000 | .028233 | .003400 | ..... | ..... | |
| 22,400 | 112,000 | .032000 | .003767 | ..... | ..... | |
| 23,200 | 116,000 | .036500 | .004500 | ..... | ..... | |
| 24,000 | 120,000 | .043000 | .006500 | ..... | ..... | |
| 26,310 | 131,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 131,550 |
| Elastic limit per square inch of original section | do... | 72,000 |
| Elongation per inch after rupture | inch.. | .1533 |
| Elongation per inch under strain at elastic limit | do... | .002400 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".04 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".09, ".18, ".24 |

## SAME METAL AS NO. 6399, ALLOWED TO COOL PARTLY AFTER ROLLING, THEN REHEATED AND ANNEALED IN CHARCOAL.

### No. 6409.

Marks, S. R. B. from breech.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000867 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 13,000 | 65,000 | .002200 | .000200 | ..... | ..... | |
| 13,600 | 68,000 | .002300 | .000100 | ..... | ..... | Elastic limit. |
| 13,800 | 69,000 | .005600 | .003300 | ..... | ..... | |
| 14,000 | 70,000 | .006333 | .000733 | ..... | ..... | |
| 14,200 | 71,000 | .009200 | .002867 | ..... | ..... | |
| 14,400 | 72,000 | .009733 | .000533 | ..... | ..... | |
| 14,800 | 74,000 | .011000 | .001267 | ..... | ..... | |
| 15,200 | 76,000 | .011767 | .000767 | ..... | ..... | |
| 16,000 | 80,000 | .014233 | .002466 | ..... | ..... | |
| 16,800 | 84,000 | .017000 | .002767 | ..... | ..... | |
| 17,600 | 88,000 | .019667 | .002667 | ..... | ..... | |
| 18,400 | 92,000 | .022500 | .002833 | ..... | ..... | |
| 19,200 | 96,000 | .025600 | .003100 | ..... | ..... | |
| 20,000 | 100,000 | .029333 | .003733 | ..... | ..... | |
| 20,800 | 104,000 | .032833 | .003500 | ..... | ..... | |
| 21,600 | 108,000 | .037733 | .004900 | ..... | ..... | |
| 22,400 | 112,000 | .044333 | .006600 | ..... | ..... | |
| 24,890 | 124,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 124,450 |
| Elastic limit per square inch of original section | do... | 68,000 |
| Elongation per inch after rupture | inch.. | .1667 |
| Elongation per inch under strain at elastic limit | do... | .002300 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | fine, silky, serrated |
| Elongation of inch sections | | ".10, ".07, ".33* |

## No. 6410.

Marks, S. R. M. from muzzle.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 13,000 | 65,000 | .002233 | .000200 | ..... | ..... | |
| 14,000 | 70,000 | .002400 | .000167 | ..... | ..... | Elastic limit. |
| | | .008933 | .006533 | ..... | ..... | |
| 14,200 | 71,000 | .009100 | .000167 | ..... | ..... | |
| 14,400 | 72,000 | .009633 | .000533 | ..... | ..... | |
| 14,800 | 74,000 | .011000 | .001367 | ..... | ..... | |
| 15,200 | 76,000 | .011933 | .000933 | ..... | ..... | |
| 16,000 | 80,000 | .014233 | .002300 | ..... | ..... | |
| 16,800 | 84,000 | .016667 | .002434 | ..... | ..... | |
| 17,600 | 88,000 | .019333 | .002666 | ..... | ..... | |
| 18,400 | 92,000 | .021833 | .002500 | ..... | ..... | |
| 19,200 | 96,000 | .025000 | .003167 | ..... | ..... | |
| 20,000 | 100,000 | .028000 | .003000 | ..... | ..... | |
| 20,800 | 104,000 | .031667 | .003667 | ..... | ..... | |
| 21,600 | 108,000 | .036333 | .004666 | ..... | ..... | |
| 22,400 | 112,000 | .041333 | .005000 | ..... | ..... | |
| 25,280 | 126,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 126,400 |
| Elastic limit per square inch of original section | do... | 70,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .002400 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".30, ".10, ".07 |

## No. 6400.

**Marks**, 78.
**Diameter**, ".505.
**Sectional area**, .20 square inch.
**Gauged length**, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000867 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000867 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002400 | .000867 | ..... | ..... | |
| 15,400 | 77,000 | .002700 | .000800 | ..... | ..... | |
| 15,600 | 78,000 | .002767 | .000067 | ..... | ..... | Elastic limit. |
| 15,800 | 79,000 | .007667 | .004900 | ..... | ..... | |
| 16,000 | 80,000 | .008333 | .000666 | ..... | ..... | |
| 16,200 | 81,000 | .008767 | .000434 | ..... | ..... | |
| 16,400 | 82,000 | .009600 | .000833 | ..... | ..... | |
| 16,800 | 84,000 | .010400 | .000800 | ..... | ..... | |
| 17,600 | 88,000 | .013067 | .002667 | ..... | ..... | |
| 18,400 | 92,000 | .015267 | .002200 | ..... | ..... | |
| 19,200 | 96,000 | .018333 | .003066 | ..... | ..... | |
| 20,000 | 100,000 | .020667 | .002334 | ..... | ..... | |
| 20,800 | 104,000 | .023333 | .002666 | ..... | ..... | |
| 21,600 | 108,000 | .026333 | .003000 | ..... | ..... | |
| 22,400 | 112,000 | .030333 | .004000 | ..... | ..... | |
| 23,200 | 116,000 | .034333 | .004000 | ..... | ..... | |
| 24,000 | 120,000 | .039000 | .004667 | ..... | ..... | |
| 26,910 | 134,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 134,550 |
| Elastic limit per square inch of original section | do... | 78,000 |
| Elongation per inch after rupture | inch.. | .1583 |
| Elongation per inch under strain at elastic limit | do... | .002767 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".10, ".26, ".10 |

## SPECIMENS FROM BAR AS RECEIVED.

### No. 6405.

Marks, 80 E, from end of bar.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 11,600 | 58,000 | .001967 | .000267 | ..... | ..... | |
| 11,800 | 59,000 | .002000 | .000033 | ..... | ..... | Elastic limit. |
| 12,000 | 60,000 | .002200 | .000200 | ..... | ..... | |
| 12,200 | 61,000 | .004000 | .001800 | ..... | ..... | |
| 12,400 | 62,000 | .004400 | .000400 | ..... | ..... | |
| 12,600 | 63,000 | .004967 | .000567 | ..... | ..... | |
| 12,800 | 64,000 | .005367 | .000400 | ..... | ..... | |
| 13,200 | 66,000 | .006667 | .001300 | ..... | ..... | |
| 13,600 | 68,000 | .007767 | .001100 | ..... | ..... | |
| 14,400 | 72,000 | .010000 | .002233 | ..... | ..... | |
| 15,200 | 76,000 | .012333 | .002333 | ..... | ..... | |
| 16,000 | 80,000 | .015000 | .002667 | ..... | ..... | |
| 16,800 | 84,000 | .017667 | .002667 | ..... | ..... | |
| 17,600 | 88,000 | .020733 | .003066 | ..... | ..... | |
| 18,400 | 92,000 | .023667 | .002934 | ..... | ..... | |
| 19,200 | 96,000 | .027167 | .003500 | ..... | ..... | |
| 20,000 | 100,000 | .031333 | .004166 | ..... | ..... | |
| 20,800 | 104,000 | .036333 | .005000 | ..... | ..... | |
| 21,600 | 108,000 | .043333 | .007000 | ..... | ..... | |
| 22,400 | 112,000 | .050333 | .007000 | ..... | ..... | |
| 24,020 | 120,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 120,100 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .1667 |
| Elongation per inch under strain at elastic limit | do... | .002000 |
| Reduction in diameter at point of rupture | do... | .096 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, interspersed with granular metal at the circumference |
| Elongation of inch sections | | ".12, ".27, ".11 |

## No. 6406.

Marks, 80 M, from middle of bar.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | ..... | ..... | |
| 11,000 | 55,000 | .001900 | .000200 | ..... | ..... | |
| 11,600 | 58,000 | .002000 | .000100 | ..... | ..... | |
| 11,800 | 59,000 | .002033 | .000033 | ..... | ..... | Elastic limit |
| 12,000 | 60,000 | .002300 | .000267 | ..... | ..... | |
| 12,200 | 61,000 | .004100 | .001800 | ..... | ..... | |
| 12,400 | 62,000 | .004467 | .000367 | ..... | ..... | |
| 12,800 | 64,000 | .005567 | .001100 | ..... | ..... | |
| 13,200 | 66,000 | .006767 | .001200 | ..... | ..... | |
| 13,600 | 68,000 | .007667 | .000900 | ..... | ..... | |
| 14,400 | 72,000 | .010167 | .002500 | ..... | ..... | |
| 15,200 | 76,000 | .012333 | .002166 | ..... | ..... | |
| 16,000 | 80,000 | .015000 | .002667 | ..... | ..... | |
| 16,800 | 84,000 | .017667 | .002667 | ..... | ..... | |
| 17,600 | 88,000 | .020400 | .002733 | ..... | ..... | |
| 18,400 | 92,000 | .023933 | .003533 | ..... | ..... | |
| 19,200 | 96,000 | .027333 | .003400 | ..... | ..... | |
| 20,000 | 100,000 | .032000 | .004667 | ..... | ..... | |
| 20,800 | 104,000 | .036667 | .004667 | ..... | ..... | |
| 21,600 | 108,000 | .042833 | .006166 | ..... | ..... | |
| 22,400 | 112,000 | .051000 | .008167 | ..... | ..... | |
| 24,030 | 120,150 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 120,150 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .002033 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, interspersed with granular metal at the circumference |
| Elongation of inch sections | | ".12, ".24*, ".11 |

## Specimens from Barrel Rolled and Annealed in Charcoal.

### No. 6407.

Marks, 80 R B, breech end.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | .000067 | .000067 | Elastic limit. |
| 10,200 | 51,000 | .003667 | .001967 | ..... | ..... | |
| 10,400 | 52,000 | .005500 | .001833 | ..... | ..... | |
| 10,600 | 53,000 | .006067 | .000567 | ..... | ..... | |
| 10,800 | 54,000 | .006633 | .000566 | ..... | ..... | |
| 11,200 | 56,000 | .007667 | .001034 | ..... | ..... | |
| 11,600 | 58,000 | .008833 | .001166 | ..... | ..... | |
| 12,000 | 60,000 | .010333 | .001500 | ..... | ..... | |
| 12,800 | 64,000 | .012667 | .002334 | ..... | ..... | |
| 13,600 | 68,000 | .015367 | .002700 | ..... | ..... | |
| 14,400 | 72,000 | .017667 | .002300 | ..... | ..... | |
| 15,200 | 76,000 | .020833 | .003166 | ..... | ..... | |
| 16,000 | 80,000 | .024400 | .003567 | ..... | ..... | |
| 16,800 | 84,000 | .028333 | .003933 | ..... | ..... | |
| 17,600 | 88,000 | .033000 | .004667 | ..... | ..... | |
| 18,400 | 92,000 | .038000 | .005000 | ..... | ..... | |
| 19,200 | 96,000 | .044667 | .006667 | ..... | ..... | |
| 20,000 | 100,000 | .054000 | .009333 | ..... | ..... | |
| 21,710 | 108,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 108,550 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | 1 "from neck |
| Character of broken surface | | silky, interspersed with granular metal at the circumference. |
| Elongation of inch sections | | ".22", ".15, ".10 |

## No. 6408.

Marks, 80 R. M. muzzle end.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | ..... | ..... | |
| 11,000 | 55,000 | .001867 | .000200 | ..... | ..... | |
| 11,200 | 56,000 | .001900 | .000033 | ..... | ..... | |
| 11,400 | 57,000 | .001967 | .000067 | ..... | ..... | Elastic limit. |
| 11,600 | 58,000 | .007500 | .005533 | ..... | ..... | |
| 11,800 | 59,000 | .008200 | .000700 | ..... | ..... | |
| 12,000 | 60,000 | .008600 | .000400 | ..... | ..... | |
| 12,400 | 62,000 | .009667 | .001067 | ..... | ..... | |
| 12,800 | 64,000 | .010733 | .001066 | ..... | ..... | |
| 13,600 | 68,000 | .013333 | .002600 | ..... | ..... | |
| 14,400 | 72,000 | .016233 | .002900 | ..... | ..... | |
| 15,200 | 76,000 | .019167 | .002934 | ..... | ..... | |
| 16,000 | 80,000 | .022100 | .002933 | ..... | ..... | |
| 16,800 | 84,000 | .025333 | .003233 | ..... | ..... | |
| 17,600 | 88,000 | .029167 | .003834 | ..... | ..... | |
| 18,400 | 92,000 | .033333 | .004166 | ..... | ..... | |
| 19,200 | 96,000 | .038667 | .005334 | ..... | ..... | |
| 20,000 | 100,000 | .046333 | .007666 | ..... | ..... | |
| 22,570 | 112,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,850 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .1900 |
| Elongation per inch under strain at elastic limit | do... | .001967 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 87.1 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".15, ".30, ".12 |

## No. 6411.

From end of bar as received.
Marks, S. E.
Diameter, ".505.
Sectional area, .20 square inch.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000367 | ..... | ..... | |
| 15,000 | 75,000 | .002600 | .000233 | ..... | ..... | Elastic limit. |
| 15,200 | 76,000 | .004167 | .001567 | ..... | ..... | |
| 15,400 | 77,000 | .005100 | .000933 | ..... | ..... | |
| 15,600 | 78,000 | .006000 | .000900 | ..... | ..... | |
| 16,000 | 80,000 | .006500 | .000500 | ..... | ..... | |
| 16,800 | 84,000 | .009333 | .002833 | ..... | ..... | |
| 17,600 | 88,000 | .010500 | .001667 | ..... | ..... | |
| 18,400 | 92,000 | .012833 | .002333 | ..... | ..... | |
| 19,200 | 96,000 | .015000 | .002167 | ..... | ..... | |
| 20,000 | 100,000 | .017333 | .002333 | ..... | ..... | |
| 20,800 | 104,000 | .020133 | .002800 | ..... | ..... | |
| 21,600 | 108,000 | .022500 | .002367 | ..... | ..... | |
| 22,400 | 112,000 | .025667 | .003167 | ..... | ..... | |
| 23,200 | 116,000 | .029167 | .003500 | ..... | ..... | |
| 24,000 | 120,000 | .033333 | .004166 | ..... | ..... | |
| 27,620 | 138,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 138,100 |
| Elastic limit per square inch of original section | do... | 75,000 |
| Elongation per inch after rupture | inch.. | .1533 |
| Elongation per inch under strain at elastic limit | do... | .002600 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".25 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".08, ".23*, ".15 |

## No. 6412.

From middle of bar as received.
Marks, S M.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000367 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002033 | .000366 | ..... | ..... | |
| 14,000 | 70,000 | .002367 | .000334 | ..... | ..... | |
| 14,900 | 74,000 | .002533 | .000166 | ..... | ..... | Elastic limit. |
| 15,000 | 75,000 | .002700 | .000167 | ..... | ..... | |
| 15,200 | 76,000 | .005033 | .002333 | ..... | ..... | |
| 15,400 | 77,000 | .005433 | .000400 | ..... | ..... | |
| 15,600 | 78,000 | .006033 | .000600 | ..... | ..... | |
| 16,000 | 80,000 | .006767 | .000734 | ..... | ..... | |
| 16,800 | 84,000 | .009100 | .002333 | ..... | ..... | |
| 17,600 | 88,000 | .011000 | .001900 | ..... | ..... | |
| 18,400 | 92,000 | .013067 | .002067 | ..... | ..... | |
| 19,200 | 96,000 | .015700 | .002633 | ..... | ..... | |
| 20,000 | 100,000 | .017967 | .002267 | ..... | ..... | |
| 20,800 | 104,000 | .020833 | .002866 | ..... | ..... | |
| 21,600 | 108,000 | .023333 | .002500 | ..... | ..... | |
| 22,400 | 112,000 | .026667 | .003334 | ..... | ..... | |
| 23,200 | 116,000 | .030100 | .003433 | ..... | ..... | |
| 24,000 | 120,000 | .034333 | .004233 | ..... | ..... | |
| 27,510 | 137,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 137,550 |
| Elastic limit, per square inch of original section | do... | 74,000 |
| Elongation per inch after rupture | inch.. | .1567 |
| Elongation per inch under strain at elastic limit | do... | .002533 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per centum of original section | | 43.8 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".10, ".28*, ".09 |

## No. 6413.

From end of bar.
Marks, $S_1$ E.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000367 | ..... | ..... | |
| 13,400 | 67,000 | .002333 | .000266 | ..... | ..... | |
| 13,600 | 68,000 | .002367 | .000034 | ..... | ..... | Elastic limit. |
| 13,800 | 69,000 | .004667 | .002300 | ..... | ..... | |
| 14,000 | 70,000 | .005333 | .000666 | ..... | ..... | |
| 14,400 | 72,000 | .005900 | .000567 | ..... | ..... | |
| 15,200 | 76,000 | .007600 | .001700 | ..... | ..... | |
| 16,000 | 80,000 | .010000 | .002400 | ..... | ..... | |
| 18,800 | 84,000 | .011767 | .001767 | ..... | ..... | |
| 17,600 | 88,000 | .014000 | .002233 | ..... | ..... | |
| 18,400 | 92,000 | .016400 | .002400 | ..... | ..... | |
| 19,200 | 96,000 | .019000 | .002600 | ..... | ..... | |
| 20,000 | 100,000 | .021233 | .002233 | ..... | ..... | |
| 20,800 | 104,000 | .024667 | .003434 | ..... | ..... | |
| 21,600 | 108,000 | .027500 | .002833 | ..... | ..... | |
| 22,400 | 112,000 | .031167 | .003667 | ..... | ..... | |
| 23,200 | 116,000 | .035000 | .003833 | ..... | ..... | |
| 24,000 | 120,000 | .040500 | .005500 | ..... | ..... | |
| 26,620 | 133,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 133,100 |
| Elastic limit per square inch of original section | do... | 68,000 |
| Elongation per inch after rupture | inch... | .1500 |
| Elongation per inch under strain at elastic limit | do... | .002367 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | fine silky, with trace of granulation |
| Elongation of inch sections | | ".13, ".23*, ".09 |

## No. 6414.

From middle of bar.
Marks, S 1 M.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000333 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000367 | ..... | ..... | |
| 13,600 | 68,000 | .002300 | .000233 | ..... | ..... | |
| 13,800 | 69,000 | .002333 | .000033 | ..... | ..... | Elastic limit. |
| 14,000 | 70,000 | .004400 | .002067 | ..... | ..... | |
| 14,200 | 71,000 | .004900 | .000500 | ..... | ..... | |
| 14,400 | 72,000 | .005067 | .000167 | ..... | ..... | |
| 14,800 | 74,000 | .005867 | .000800 | ..... | ..... | |
| 15,200 | 76,000 | .007000 | .001133 | ..... | ..... | |
| 16,000 | 80,000 | .009333 | .002333 | ..... | ..... | |
| 16,800 | 84,000 | .011000 | .001667 | ..... | ..... | |
| 17,600 | 88,000 | .013067 | .002067 | ..... | ..... | |
| 18,400 | 92,000 | .015333 | .002266 | ..... | ..... | |
| 19,200 | 96,000 | .018000 | .002667 | ..... | ..... | |
| 20,000 | 100,000 | .020500 | .002500 | ..... | ..... | |
| 20,800 | 104,000 | .022833 | .002333 | ..... | ..... | |
| 21,600 | 108,000 | .026433 | .003600 | ..... | ..... | |
| 22,400 | 112,000 | .029333 | .002900 | ..... | ..... | |
| 23,200 | 116,000 | .033667 | .004334 | ..... | ..... | |
| 24,000 | 120,000 | .038667 | .005000 | ..... | ..... | |
| 25,860 | 134,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 134,300 |
| Elastic limit per square inch of original section | do... | 69,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .002333 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".16 from neck |
| Character of broken surface | | fine silky, with trace of granulation |
| Elongation of inch sections | | ".09,".19* ".17* |

## RED-END BARS.

### No. 6417.

From bar as received.
Marks, 81 R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | 0. | ..... | |
| 12,000 | 60,000 | .002067 | .000367 | ..... | ..... | |
| 13,000 | 65,000 | .002267 | .000200 | ..... | ..... | |
| 13,200 | 66,000 | .002300 | .000033 | ..... | ..... | Elastic limit. |
| | | .006667 | .004367 | ..... | ..... | |
| 13,400 | 67,000 | .007333 | .000666 | ..... | ..... | |
| 13,600 | 68,000 | .007933 | .000600 | ..... | ..... | |
| 14,000 | 70,000 | .009000 | .001067 | ..... | ..... | |
| 14,400 | 72,000 | .010067 | .001067 | ..... | ..... | |
| 15,200 | 76,000 | .013033 | .002967 | ..... | ..... | |
| 16,000 | 80,000 | .015700 | .002667 | ..... | ..... | |
| 16,800 | 84,000 | .018667 | .002967 | ..... | ..... | |
| 17,600 | 88,000 | .021700 | .003033 | ..... | ..... | |
| 18,400 | 92,000 | .025367 | .003667 | ..... | ..... | |
| 19,200 | 96,000 | .029333 | .003966 | ..... | ..... | |
| 20,000 | 100,000 | .033733 | .004400 | ..... | ..... | |
| 20,800 | 104,000 | .038500 | .004767 | ..... | ..... | |
| 21,600 | 108,000 | .045667 | .007167 | ..... | ..... | |
| 22,400 | 112,000 | .054333 | .008666 | ..... | ..... | |
| 23,810 | 119,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 119,050 |
| Elastic limit per square inch of original section | do... | 66,000 |
| Elongation per inch after rupture | inch.. | .1833 |
| Elongation per inch under strain at elastic limit | do... | .002300 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | do... | 46.2 |
| Position of rupture | | 1".35 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".17, ".28*, ".10 |

## RED-END BAR.

### No. 6418.

From breech end of barrel, rolled and annealed.
Marks, 81 R R.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000367 | ..... | ..... | |
| 11,000 | 55,000 | .001833 | .000133 | ..... | ..... | |
| 11,200 | 56,000 | .001867 | .000034 | ..... | ..... | Elastic limit. |
| 11,400 | 57,000 | .006000 | .004133 | ..... | ..... | |
| 11,600 | 58,000 | .008267 | .002267 | ..... | ..... | |
| 11,800 | 59,000 | .010400 | .002133 | ..... | ..... | |
| 12,000 | 60,000 | .011333 | .000933 | ..... | ..... | |
| 12,400 | 62,000 | .012333 | .001000 | ..... | ..... | |
| 12,800 | 64,000 | .013900 | .001567 | ..... | ..... | |
| 13,600 | 68,000 | .017400 | .003500 | ..... | ..... | |
| 14,400 | 72,000 | .020333 | .002933 | ..... | ..... | |
| 15,200 | 76,000 | .023667 | .003334 | ..... | ..... | |
| 16,000 | 80,000 | .027500 | .003833 | ..... | ..... | |
| 16,800 | 84,000 | .032500 | .005000 | ..... | ..... | |
| 17,600 | 88,000 | .038333 | .005833 | ..... | ..... | |
| 18,400 | 92,000 | .045000 | .006667 | ..... | ..... | |
| 19,200 | 96,000 | .054333 | .009333 | ..... | ..... | |
| 20,910 | 104,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 104,550 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .1900 |
| Elongation per inch under strain at elastic limit | do... | .001867 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".12, ".33* ".12 |

## GREEN-END BARS.

### No. 6419.

From bar as received.
Marks, 81 G.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000366 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000334 | 0. | ..... | |
| 12,000 | 60,000 | .002000 | .000333 | ..... | ..... | |
| 13,400 | 67,000 | .002233 | .000233 | ..... | ..... | |
| 13,600 | 68,000 | .002267 | .000034 | ..... | ..... | Elastic limit. |
| | | .012000 | .009733 | ..... | ..... | |
| 13,800 | 69,000 | .012567 | .000567 | ..... | ..... | |
| 14,000 | 70,000 | .013333 | .000766 | ..... | ..... | |
| 14,400 | 72,000 | .014333 | .001000 | ..... | ..... | |
| 14,800 | 74,000 | .016267 | .001934 | ..... | ..... | |
| 15,200 | 76,000 | .018333 | .002066 | ..... | ..... | |
| 16,000 | 80,000 | .021500 | .003167 | ..... | ..... | |
| 16,800 | 84,000 | .025167 | .003667 | ..... | ..... | |
| 17,600 | 88,000 | .030000 | .004833 | ..... | ..... | |
| 18,400 | 92,000 | .034333 | .004333 | ..... | ..... | |
| 19,200 | 96,000 | .040667 | .006334 | ..... | ..... | |
| 20,000 | 100,000 | .048000 | .007333 | ..... | ..... | |
| 20,800 | 104,000 | .056667 | .008667 | ..... | ..... | |
| 22,300 | 111,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 111,500 |
| Elastic limit per square inch of original section | do... | 68,000 |
| Elongation per inch after rupture | inch.. | .1900 |
| Elongation per inch under strain at elastic limit | do... | .002267 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".13, ".32*, ".12 |

## GREEN-END BAR.

### No. 6420.

From breech end of barrel rolled and annealed.
Marks, 81 R.G.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000333 | ..... | ..... | |
| 10,000 | 50,000 | .001667 | .000367 | ..... | ..... | |
| 11,600 | 58,000 | .001933 | .000266 | ..... | ..... | |
| 11,800 | 59,000 | .001967 | .000034 | ..... | ..... | Elastic limit. |
| 12,000 | 60,000 | .014667 | .012700 | ..... | ..... | |
| 12,200 | 61,000 | .015500 | .000833 | ..... | ..... | |
| 12,400 | 62,000 | .016500 | .001000 | ..... | ..... | |
| 12,800 | 64,000 | .018667 | .002167 | ..... | ..... | |
| 13,600 | 68,000 | .025833 | .007166 | ..... | ..... | |
| 14,400 | 72,000 | .026667 | .000834 | ..... | ..... | |
| 15,200 | 76,000 | .031500 | .004833 | ..... | ..... | |
| 16,000 | 80,000 | .037333 | .005833 | ..... | ..... | |
| 16,800 | 84,000 | .044333 | .007000 | ..... | ..... | |
| 17,600 | 88,000 | .054000 | .009667 | ..... | ..... | |
| 19,710 | 98,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 98,550 |
| Elastic limit per square inch of original section | do... | 59,000 |
| Elongation per inch after rupture | inch.. | .2167 |
| Elongation per inch under strain at elastic limit | do... | .001967 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".7 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch section | | ".16, ".35*, ".14 |

## From Rolled Barrel, Reheated in New Annealing Furnace and Annealed in Charcoal.

### No. 6438.

Marks, S 1.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 3″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000033 | .000033 | 0. | ..... | |
| 2,000 | 10,000 | .000267 | .000234 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001167 | .000167 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000166 | ..... | ..... | |
| 8,800 | 44,000 | ..... | ..... | ..... | ..... | Elastic limit, approximate. |
| 9,000 | 45,000 | .001667 | .000334 | .000100 | .000100 | |
| 9,200 | 46,000 | .001800 | .000133 | ..... | ..... | |
| 9,400 | 47,000 | .002067 | .000267 | ..... | ..... | |
| 9,600 | 48,000 | .003467 | .001400 | ..... | ..... | |
| 9,800 | 49,000 | .004000 | .000533 | ..... | ..... | |
| 10,000 | 50,000 | .004433 | .000433 | ..... | ..... | |
| 10,200 | 51,000 | .004733 | .000300 | ..... | ..... | |
| 10,400 | 52,000 | .005067 | .000334 | ..... | ..... | |
| 10,600 | 53,000 | .005500 | .000433 | ..... | ..... | |
| 10,800 | 54,000 | .006333 | .000833 | ..... | ..... | |
| 11,000 | 55,000 | .006800 | .000467 | ..... | ..... | |
| 11,600 | 58,000 | .008333 | .001533 | ..... | ..... | |
| 12,000 | 60,000 | .009333 | .001000 | ..... | ..... | |
| 12,400 | 62,000 | .010467 | .001134 | ..... | ..... | |
| 12,800 | 64,000 | .011333 | .000866 | ..... | ..... | |
| 13,600 | 68,000 | .013600 | .002267 | ..... | ..... | |
| 14,400 | 72,000 | .016433 | .002833 | ..... | ..... | |
| 15,200 | 76,000 | .018933 | .002500 | ..... | ..... | |
| 16,000 | 80,000 | .021667 | .002734 | ..... | ..... | |
| 16,800 | 84,000 | .025167 | .003500 | ..... | ..... | |
| 17,600 | 88,000 | .029000 | .003833 | ..... | ..... | |
| 18,400 | 92,000 | .030233 | .001233 | ..... | ..... | |
| 19,200 | 96,000 | .037100 | .006867 | ..... | ..... | |
| 22,580 | 112,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,900 |
| Elastic limit per square inch of original section (approximate) | do... | 44,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ″.90 from neck |
| Character of broken surface | | fine, granular |
| Elongation of inch sections | | ″.16*, ″.12, ″.08 |

TABULATION OF TENSION SPECIMENS FROM RIFLE-BARREL STEEL (LENGTH OF STEMS 3").

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation in 8 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch section. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | " " " | |
| 6016 | A I M | .505 | .20 | 71,000 | 118,100 | 17.3 | 37.1 | Silky, interspersed with fine granulation, cup shaped. | .11, .29*, .12 | |
| 6017 | A I M | .505 | .20 | 75,000 | 117,400 | 19.0 | 40.3 | do | .12, .31*, .14 | |
| 6018 | A I M | .505 | .20 | 72,000 | 115,700 | 18.3 | 40.3 | Fine silky, cup shaped | .12, .32*, .11 | |
| 6019 | A I E | .505 | .20 | 77,000 | 118,800 | 17.7 | 40.3 | Silky, interspersed with fine granulation, cup shaped | .25*, .18, .10 | |
| 6020 | A I E | .505 | .20 | 72,000 | 117,900 | 17.7 | 37.1 | do | .12, .28*, .13 | |
| 6021 | A I E | .505 | .20 | 71,000 | 113,050 | 20.0 | 43.3 | Fine silky, cup shaped | .14, .34*, .12 | |
| 6068 | A | .505 | .20 | 67,000 | 103,900 | 22.3 | 46.2 | Fine silky | .25*, .29*, .13 | |
| 6069 | A | .505 | .20 | 69,000 | 114,050 | 17.7 | 43.3 | do | .30*, .13, .10 | |
| 6070 | A | .505 | .20 | 70,000 | 106,950 | 20.0 | 43.3 | do | .12, .34*, .14 | |
| 6096 | 78 | .505 | .20 | 75,000 | 123,050 | 15.0 | 30.7 | Fine granular, radiating from the center | .10, .13, .22* | |
| 6097 | 78 • | .505 | .20 | 64,000 | 116,000 | 14.0 | 27.4 | Silky, interspersed with fine granulation, radiating from the center. | .23*, .11, .08 | From butt of barrels heated in new furnace and rolled. |
| 6098 | 78 • | .505 | .20 | 66,000 | 114,100 | 13.3 | 23.9 | Silky, interspersed with fine granulation | .21*, .12, .07 | From butt of barrels heated in new furnace and rolled. |
| 6099 | B ◇ R | .505 | .20 | 101,000 | 125,500 | 16.3 | 34.0 | Fine silky, cup shaped, serrated surface | .09, .19, .21* | |
| 6100 | B ◇ R | .505 | .20 | 103,000 | 127,300 | 15.0 | 43.3 | Fine silky, cup shaped | .07, .11, .27* | |
| 6101 | B ◇ R | .505 | .20 | 103,000 | 126,350 | 15.0 | 37.1 | do | .09, .10, .26* | |
| 6102 | B ◇ W | .505 | .20 | 87,000 | 111,050 | 18.7 | 46.2 | do | .29*, .16, .11 | |
| 6103 | B ◇ W | .505 | .20 | 87,000 | 112,550 | 17.3 | 40.3 | do | .10, .29*, .13 | |
| 6104 | B ◇ W | .505 | .20 | 85,000 | 112,550 | 17.7 | 30.7 | do | .11, .22*, .20* | |
| 6123 | 79 E | .505 | .20 | 69,000 | 115,300 | 20.0 | 51.9 | Fine silky | .13, .35*, .12 | End of bar before rolling. |
| 6124 | 79 E B | .505 | .20 | 64,000 | 104,000 | 18.3 | 37.1 | do | .12, .24*, .19 | End of bar after rolling. |
| 6125 | 79 M | .505 | .20 | 68,000 | 115,050 | 19.0 | 46.2 | do | .16, .30*, .11 | Middle of bar before rolling. |
| 6126 | 79 M B | .505 | .20 | 66,000 | 105,100 | 18.0 | 43.3 | Silky | .10, .31*, .13 | Middle of bar after rolling. |
| 6155 | A E 1 | .505 | .20 | 75,000 | 125,550 | 15.7 | 27.4 | Silky, interspersed with fine granulation | .11, .24*, .12 | |
| 6156 | A E 2 | .505 | .20 | 77,000 | 118,500 | 20.3 | 43.3 | Fine silky | .13, .34*, .14 | |
| 6157 | A M 1 | .505 | .20 | 76,000 | 117,100 | 19.3 | 46.2 | do | .14, .32*, .12 | |
| 6158 | A M 2 | .505 | .20 | 75,000 | 124,550 | 14.0 | 16.9 | Fine granular, radiating from the center | .14, .17*, .11 | |
| 6159 | A R 1 | .505 | .20 | 72,000 | 112,000 | 18.7 | 40.3 | Fine silky | .14, .31*, .11 | |
| 6160 | A R 2 | .505 | .20 | 62,000 | 109,550 | 17.0 | 37.1 | do | .10, .13, .28* | |
| 6262 | 78 B | .505 | .20 | 71,000 | 133,550 | 15.0 | 43.3 | do | .14, .24*, .07 | |
| 6263 | 78 B R | .505 | .20 | 60,000 | 123,200 | 15.7 | 34.0 | Silky, interspersed with fine granulation | .13, .25*, .09 | |
| 6264 | 78 R | .505 | .20 | 64,000 | 112,000 | 20.3 | 49.1 | Fine silky | .13, .35*, .13 | |
| 6265 | 78 R R | .505 | .20 | 58,000 | 104,350 | 20.3 | 46.2 | do | .14, .33*, .14 | |
| 6289 | A I G | .505 | .20 | 76,000 | 126,550 | 17.0 | 40.3 | Fine silky, dark gray | .11, .28*, .12 | |
| 6290 | A I R | .505 | .20 | 69,000 | 104,600 | 22.3 | 51.9 | do | .13, .38*, .16 | |
| 6291 | A I W | .505 | .20 | 79,000 | 134,450 | 15.7 | 37.1 | do | .10, .26*, .11 | |
| 6292 | 78 B X | .505 | .20 | 75,000 | 136,050 | 15.3 | 43.3 | Silky, interspersed with fine granulation, cup shaped. | .20*, .17, .09 | |
| 6293 | 78 B R X | .505 | .20 | 71,000 | 132,600 | 15.0 | 46.2 | Fine silky, cup shaped | .27*, .11, .07 | |

*TABULATION OF TENSION SPECIMENS FROM RIFLE-BARREL STEEL (LENGTH OF STEMS 3″)*—Continued.

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation in 3 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch section. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | ″ ″ ″ | |
| 6294 | 78 B R* | .505 | .20 | 74,000 | 130,500 | 16.3 | 49.1 | Fine silky, cup shaped | .09, .30*, .10 | |
| 6306 | A. I. B | .505 | .20 | 73,000 | 122,550 | 18.3 | 49.1 | do | .11, .29*, .15 | |
| 6307 | A I B. 1 | .505 | .20 | 81,000 | 139,450 | 14.7 | 34.0 | Silky, interspersed with fine granulation, radiating from the center. | .10, .24*, .10 | |
| 6308 | A I Y | .505 | .20 | 67,000 | 99,500 | 24.0 | 54.6 | Fine silky, cup shaped | .15, .41*, .16 | |
| 6309 | A I R 1 | .505 | .20 | 69,000 | 105,450 | 22.0 | 54.6 | do | .13, .34*, .19 | |
| 6310 | A I R R 1 | .505 | .20 | 65,000 | 102,100 | 21.7 | 51.9 | Fine silky | .12, .33*, .20 | |
| 6311 | A I R 2 | .505 | .20 | 72,000 | 113,000 | 19.7 | 43.3 | Fine silky, cup shaped | .13, .33*, .13 | |
| 6312 | A I R R 2 | .505 | .20 | 75,000 | 108,000 | 21.3 | 49.1 | Fine silky | .29*, .23*, .12 | |
| 6313 | A I R 3 | .505 | .20 | 69,000 | 102,800 | 23.7 | 54.6 | Fine silky, cup shaped | .15, .40*, .16 | |
| 6314 | A I R R 3 | .505 | .20 | 70,000 | 97,100 | 24.7 | 57.2 | do | .14, .39, .21 | |
| 6317 | 78 U | .505 | .20 | 75,000 | 126,600 | 17.3 | 46.2 | do | .10, .30*, .12 | |
| 6318 | 78 U B | .505 | .20 | 68,000 | 101,050 | 21.3 | 51.9 | do | .34*, .19, .11 | |
| 6337 | S | .505 | .20 | 70,000 | 132,050 | 16.0 | 43.3 | Fine silky | .09, .29*, .10 | |
| 6338 | C S | .505 | .20 | 66,000 | 125,500 | 16.0 | 43.3 | do | .11, .27*, .10 | |
| 6339 | S ✪ | .505 | .20 | 69,000 | 133,650 | 16.3 | 43.3 | do | .09, .28*, .12 | |
| 6340 | S S ✪ | .505 | .20 | 70,000 | 133,550 | 14.7 | 43.3 | do | .23*, .14, .07 | |
| 6357 | S C ✪ | .506 | .20 | 54,000 | 113,000 | 15.0 | 44.6 | Silky, interspersed with fine granulation | .13, .23*, .11 | Rolled barrel annealed in charcoal. |
| 6369 | S O | .588 / .295 | .203 | [1]43,000 | 108,280 | 16.3 | | Granular 85 per cent; silky 15 per cent | .11, .25*, .13 | From butt of barrel after special treatment. |
| 6373 | S C L | .506 | .20 | 56,000 | 113,950 | 16.0 | 34.0 | Silky, interspersed with fine granulation | .09, .13, .26* | Rolled barrel, annealed in charcoal. |
| 6374 | S L | .506 | .20 | 62,000 | 127,850 | 13.3 | 30.7 | Silky center, fine granular at the circumference. | .08, .22*, .10 | Rolled barrel, annealed in lime. |
| 6375 | S. S. S | .505 | .20 | 65,000 | 128,100 | 14.3 | 40.3 | Fine silky | .07, .16, .20* | Rolled barrel, annealed in sand. |
| 6377 | A $B_1$ | .505 | .20 | 72,000 | 113,500 | 19.3 | 43.3 | Fine silky, with trace of granulation | .14, .31*, .13 | |
| 6378 | A $B_2$ | .505 | .20 | 74,000 | 119,450 | 17.3 | 37.1 | do | .25*, .16, .11 | |
| 6379 | A $G_1$ | .505 | .20 | 72,000 | 112,450 | 20.0 | 46.2 | do | .12, .34*, .14 | |
| 6380 | A $G_2$ | .506 | .20 | 77,000 | 130,100 | 14.3 | 30.7 | Fine silky, interspersed with granular metal | .20*, .14, .09 | |
| 6381 | A $B_1$, R | .505 | .20 | 65,000 | 105,950 | 20.0 | 43.3 | Fine silky, trace of granulation | .12, .19, .29* | |
| 6382 | A $B_2$, R | .505 | .20 | 66,000 | 111,250 | 15.3 | 34.0 | do | .25*, .11, .10 | |
| 6383 | A $G_1$, R | .505 | .20 | 61,000 | 107,400 | 20.0 | 43.3 | Fine silky | .12, .32*, .16 | |
| 6384 | A $G_2$, R | .505 | .20 | 69,000 | 121,350 | 14.7 | 27.4 | Fine granular | .10, .23*, .11 | |
| 6385 | J X | .588 / .300 | .20 | 59,000 | 126,400 | 12.3 | | do | .09, .11, .17* | |
| 6390 | L. B | .505 | .20 | 54,000 | 110,050 | 17.7 | 49.1 | Fine silky | .10, .10, .33* | Breech end: Open-hearth stock. Lime annealed in furnace after cooling from rolling heat. |
| 6391 | L. M | .505 | .20 | 61,000 | 119,700 | 18.7 | 43.3 | Silky, trace of fine granulation. Partial fracture of stem at center punch mark defining inch section on surface of stem. | .18, .27*, .11 | Muzzle end: Open-hearth stock. Lime annealed in furnace after cooling from rolling heat. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6397 | S X M | .505 | .20 | 71,000 | 114,550 | 18.7 | 40.3 | Fine silky | .13, .22*, .21 | From muzzle / From breech } Rolled barrel steel. |
| 6398 | S X B | .505 | .20 | 67,000 | 110,150 | 18.3 | 40.3 | ....do | .14, .30*, .11 | |
| 6399 | S | .505 | .20 | 72,000 | 131,550 | 16.3 | 43.3 | ....do | .09, .18, .24* | |
| 6409 | S R B | .505 | .20 | 68,000 | 124,450 | 16.7 | 51.9 | Fine silky, serrated | .10, .07, .33* | From breech / From muzzle } Same metal as No. 6399 allowed to cool partly after rolling, then reheated and annealed in charcoal. |
| 6410 | S R M | .505 | .20 | 70,000 | 126,400 | 15.7 | 46.2 | ....do | .30*, .10, .07 | |
| 6400 | 78 | .505 | .20 | 78,000 | 134,550 | 15.3 | 37.1 | Fine silky | .10, .26*, .10 | |
| 6405 | 80 E | .505 | .20 | 59,000 | 120,100 | 16.7 | 34.0 | Silky, interspersed with granular metal at the circumference. | .12, .27*, .11 | From end of bar / From middle of bar } From bar as received. |
| 6406 | 80 M | .505 | .20 | 59,000 | 120,150 | 15.7 | 30.7 | ....do | .12, .24*, .11 | |
| 6407 | 80 R B | .505 | .20 | 50,000 | 108,550 | 15.7 | 30.7 | ....do | .22*, .15, .10 | |
| 6408 | 80 R M | .505 | .20 | 57,000 | 112,850 | 19.0 | 37.1 | Fine silky | .15, .30*, .12 | Breech end / Muzzle end } From barrel rolled and annealed in charcoal. |
| 6411 | S E | .505 | .20 | 75,000 | 138,100 | 15.3 | 43.3 | ....do | .08, .23*, .15 | |
| 6412 | S M | .505 | .20 | 74,000 | 137,550 | 15.7 | 43.3 | ....do | .10, .28*, .09 | From end of bar / From middle of bar } From bar as received. |
| 6413 | $S_1$ E | .505 | .20 | 68,000 | 133,100 | 15.0 | 37.1 | Fine silky, trace of granulation | .13, .28*, .09 | |
| 6414 | $S_1$ M | .505 | .20 | 69,000 | 134,300 | 15.0 | 37.1 | ....do | .09, .19*, .07 | From end of bar / From middle of bar } From bar as received. |
| 6417 | 81 R | .505 | .20 | 66,000 | 119,050 | 18.3 | 46.2 | Fine silky | .17, .28*, .10 | |
| 6418 | 81 R R | .505 | .20 | 56,000 | 104,550 | 19.0 | 46.2 | ....do | .12, .33*, .12 | From bar as received / From breech end of barrel, rolled and annealed } Red end bars. |
| 6419 | 81 G | .505 | .20 | 68,000 | 111,500 | 19.0 | 43.3 | ....do | .13, .32*, .12 | |
| 6420 | 81 R G | .505 | .20 | 59,000 | 98,550 | 21.7 | 43.3 | ....do | .16, .35*, .14 | From bar as received / From breech end of barrel, rolled and annealed } Green end bars. |
| 6438 | $S_1$ | .505 | .20 | [1] 44,000 | 112,900 | 12.0 | 16.9 | Fine granular | .16*, .12, .08 | From rolled barrel, reheated in new annealing furnace, and annealed in charcoal. |

[1] About.

NOTE.—Where two diameters are given the specimens were hollow, the figures indicating the exterior and interior diameters, respectively.

# RECEIVERS OF RIFLES, .30-CALIBER.

## No. 6085.

**Marks, 37 R.F. 2.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | 0. | ..... | |
| 7,000 | 35,000 | .001133 | .000166 | ..... | ..... | |
| 8,000 | 40,000 | .001333 | .000200 | ..... | ..... | |
| 8,200 | 41,000 | .001367 | .000034 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000033 | ..... | ..... | Elastic limit. |
| | | .006833 | .005433 | ..... | ..... | |
| 8,600 | 43,000 | .007967 | .001134 | ..... | ..... | |
| 8,800 | 44,000 | .008333 | .000366 | ..... | ..... | |
| 9,000 | 45,000 | .009767 | .001434 | ..... | ..... | |
| 9,200 | 46,000 | .010500 | .000733 | ..... | ..... | |
| 9,600 | 48,000 | .012400 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .014333 | .001933 | ..... | ..... | |
| 10,400 | 52,000 | .017333 | .003000 | ..... | ..... | |
| 10,800 | 54,000 | .019667 | .002334 | ..... | ..... | |
| 11,200 | 56,000 | .022333 | .002666 | ..... | ..... | |
| 11,600 | 58,000 | .025067 | .002734 | ..... | ..... | |
| 12,000 | 60,000 | .028833 | .003766 | ..... | ..... | |
| 12,400 | 62,000 | .032333 | .003500 | ..... | ..... | |
| 12,800 | 64,000 | .036167 | .003834 | ..... | ..... | |
| 13,200 | 66,000 | .041833 | .005666 | ..... | ..... | |
| 13,600 | 68,000 | .046000 | .004167 | ..... | ..... | |
| 14,000 | 70,000 | .051667 | .005667 | ..... | ..... | |
| 14,400 | 72,000 | .059000 | .007333 | ..... | ..... | |
| 14,800 | 74,000 | .067000 | .008000 | ..... | ..... | |
| 15,200 | 76,000 | .0767 | .0097 | ..... | ..... | |
| 15,600 | 78,000 | .0967 | .0200 | ..... | ..... | |
| 16,000 | 80,000 | .1233 | .0266 | ..... | ..... | |
| 16,220 | 81,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 81,100 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .2567 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".42*, ".19 |

## No. 6086.

Marks, 37 R 2.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000067 | .000067 | 0. | ..... | |
| 2,000 | 10,000 | .000267 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000933 | .000333 | 0. | ..... | |
| 8,000 | 40,000 | .001200 | .000267 | ..... | ..... | |
| 8,200 | 41,000 | .001233 | .000033 | ..... | ..... | |
| 8,400 | 42,000 | .001300 | .000067 | ..... | ..... | |
| 8,600 | 43,000 | .001333 | .000033 | ..... | ..... | |
| 8,800 | 44,000 | .001367 | .000034 | ..... | ..... | |
| 9,000 | 45,000 | .001400 | .000033 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .016667 | .015267 | ..... | ..... | |
| 9,400 | 47,000 | .018333 | .001666 | ..... | ..... | |
| 9,600 | 48,000 | .019667 | .001334 | ..... | ..... | |
| 9,800 | 49,000 | .020500 | .000833 | ..... | ..... | |
| 10,000 | 50,000 | .021867 | .001367 | ..... | ..... | |
| 10,400 | 52,000 | .024833 | .002966 | ..... | ..... | |
| 10,800 | 54,000 | .028333 | .003500 | ..... | ..... | |
| 11,200 | 56,000 | .031533 | .003200 | ..... | ..... | |
| 11,600 | 58,000 | .036000 | .004467 | ..... | ..... | |
| 12,000 | 60,000 | .041167 | .005167 | ..... | ..... | |
| 12,400 | 62,000 | .046000 | .004833 | ..... | ..... | |
| 12,800 | 64,000 | .051667 | .005667 | ..... | ..... | |
| 13,200 | 66,000 | .058667 | .007000 | ..... | ..... | |
| 13,600 | 68,000 | .067333 | .008666 | ..... | ..... | |
| 14,000 | 70,000 | .079667 | .012334 | ..... | ..... | |
| 14,400 | 72,000 | .0933 | .013666 | ..... | ..... | |
| 14,800 | 74,000 | .1233 | .0300 | ..... | ..... | |
| 15,200 | 76,000 | .1767 | .0534 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.... | 76,000 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2833 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".20, ".45*, ".20 |

## No. 6315.

**Marks 38 R.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 8,200 | 41,000 | .001400 | .000033 | ..... | ..... | |
| 8,400 | 42,000 | .001433 | .000033 | ..... | ..... | |
| 8,600 | 43,000 | .001500 | .000067 | ..... | ..... | |
| 8,800 | 44,000 | .001533 | .000033 | ..... | ..... | |
| 9,000 | 45,000 | .001600 | .000067 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .001933 | .000333 | ..... | ..... | |
| 9,400 | 47,000 | .002833 | .000900 | ..... | ..... | |
| 9,600 | 48,000 | .003667 | .000834 | ..... | ..... | |
| 9,800 | 49,000 | .005067 | .001400 | ..... | ..... | |
| 10,000 | 50,000 | .007667 | .002600 | ..... | ..... | |
| 10,400 | 52,000 | .010400 | .002733 | ..... | ..... | |
| 10,800 | 54,000 | .012000 | .001600 | ..... | ..... | |
| 11,200 | 56,000 | .014000 | .002000 | ..... | ..... | |
| 12,000 | 60,000 | .018767 | .004767 | ..... | ..... | |
| 12,800 | 64,000 | .023333 | .004566 | ..... | ..... | |
| 13,600 | 68,000 | .028667 | .005334 | ..... | ..... | |
| 14,400 | 72,000 | .035500 | .006833 | ..... | ..... | |
| 15,200 | 76,000 | .043167 | .007667 | ..... | ..... | |
| 16,000 | 80,000 | .054333 | .011166 | ..... | ..... | |
| 16,800 | 84,000 | .068600 | .014267 | ..... | ..... | |
| 17,600 | 88,000 | .095667 | .027067 | ..... | ..... | |
| 18,170 | 90,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,850 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .135 |
| Reduction in area after rupture, per cent of original section | | 46.2 |
| Position of rupture | | 1".6 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".18, ".37, ".17 |

## No. 6316.

Marks, 38 R. F.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | ..... | ..... | |
| 8,000 | 40,000 | .001367 | .000367 | 0. | ..... | |
| 9,200 | 46,000 | .001600 | .000233 | ..... | ..... | |
| 9,400 | 47,000 | .001633 | .000033 | ..... | ..... | Elastic limit. |
| 9,600 | 48,000 | .012000 | .010367 | ..... | ..... | |
| 9,800 | 49,000 | .012500 | .000500 | ..... | ..... | |
| 10,000 | 50,000 | .013000 | .000500 | ..... | ..... | |
| 10,400 | 52,000 | .015267 | .002267 | ..... | ..... | |
| 10,800 | 54,000 | .017267 | .002000 | ..... | ..... | |
| 11,200 | 56,000 | .019500 | .002233 | ..... | ..... | |
| 12,000 | 60,000 | .025000 | .005500 | ..... | ..... | |
| 12,800 | 64,000 | .030333 | .005333 | ..... | ..... | |
| 13,600 | 68,000 | .036667 | .006334 | ..... | ..... | |
| 14,400 | 72,000 | .045500 | .008833 | ..... | ..... | |
| 15,200 | 76,000 | .056667 | .011167 | ..... | ..... | |
| 16,000 | 80,000 | .071000 | .014333 | ..... | ..... | |
| 16,800 | 84,000 | .098667 | .027667 | ..... | ..... | |
| 17,320 | 86,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 86,600 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001633 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky, black spot in center of fractured surface ".06 diameter, spongy at center. |
| Elongation of inch sections | | ".14, ".19, ".30* |

## From Bar.

## No. 6401.

Marks, R. C.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | 0. | ..... | |
| 7,000 | 35,000 | .001167 | .000167 | ..... | ..... | |
| 7,200 | 36,000 | .001233 | .000066 | ..... | ..... | Elastic limit. |
| 7,400 | 37,000 | .021767 | .020534 | ..... | ..... | |
| 7,600 | 38,000 | .024000 | .002233 | ..... | ..... | |
| 7,800 | 39,000 | .025733 | .001733 | ..... | ..... | |
| 8,000 | 40,000 | .027667 | .001934 | ..... | ..... | |
| 8,400 | 42,000 | .032333 | .004666 | ..... | ..... | |
| 8,800 | 44,000 | .037333 | .005000 | ..... | ..... | |
| 9,200 | 46,000 | .043333 | .006000 | ..... | ..... | |
| 9,600 | 48,000 | .050333 | .007000 | ..... | ..... | |
| 10,000 | 50,000 | .058667 | .008334 | ..... | ..... | |
| 10,400 | 52,000 | .068000 | .009333 | ..... | ..... | |
| 10,800 | 54,000 | .082167 | .014167 | ..... | ..... | |
| 11,940 | 59,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 59,700 |
| Elastic limit per square inch of original section | do... | 36,000 |
| Elongation per inch after rupture | inch.. | .3333 |
| Elongation per inch under strain at elastic limit | do... | .001233 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | | 59.8 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".23, ".54*, ".23 |

## Forged Stock.

### No. 6402.

Marks, R. C. F.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | 0. | ..... | |
| 8,000 | 40,000 | .001367 | .000400 | ..... | ..... | |
| 9,000 | 45,000 | .001567 | .000200 | ..... | ..... | |
| 9,200 | 46,000 | .001600 | .000033 | ..... | ..... | |
| 9,400 | 47,000 | .001633 | .000033 | ..... | ..... | |
| 9,600 | 48,000 | .001667 | .000034 | ..... | ..... | |
| 9,800 | 49,000 | .001667 | 0. | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000033 | ..... | ..... | |
| 10,200 | 51,000 | .001733 | .000033 | ..... | ..... | |
| 10,400 | 52,000 | .001767 | .000034 | ..... | ..... | Elastic limit. |
| 10,600 | 53,000 | .020500 | .018733 | ..... | ..... | |
| 10,800 | 54,000 | .021333 | .000833 | ..... | ..... | |
| 11,000 | 55,000 | .022667 | .001334 | ..... | ..... | |
| 11,200 | 56,000 | .023733 | .001066 | ..... | ..... | |
| 11,600 | 58,000 | .027333 | .003600 | ..... | ..... | |
| 12,000 | 60,000 | .030933 | .003600 | ..... | ..... | |
| 12,400 | 62,000 | .034933 | .004000 | ..... | ..... | |
| 12,800 | 64,000 | .039433 | .004500 | ..... | ..... | |
| 13,200 | 66,000 | .043667 | .004234 | ..... | ..... | |
| 13,600 | 68,000 | .048000 | .004333 | ..... | ..... | |
| 14,000 | 70,000 | .055667 | .007667 | ..... | ..... | |
| 16,110 | 80,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,550 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .2367 |
| Elongation per inch under strain at elastic limit | do... | .001767 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".17 from neck |
| Character of broken surface | | fine, silky, oblique; seam at center about ".06 wide |
| Elongation of inch sections | | ".81", ".24, ".16 |

## No. 6415.

From bar as received.
Marks, R C 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000333 | .000233 | ..... | ..... | |
| 4,000 | 20,000 | .000667 | .000334 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000333 | 0. | ..... | |
| 7,600 | 38,000 | .001267 | .000267 | ..... | ..... | |
| 7,800 | 39,000 | .001333 | .000066 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001633 | .000300 | ..... | ..... | |
| 8,200 | 41,000 | .011667 | .010034 | ..... | ..... | |
| 8,400 | 42,000 | .012400 | .000733 | ..... | ..... | |
| 8,600 | 43,000 | .013067 | .000667 | ..... | ..... | |
| 8,800 | 44,000 | .014000 | .000933 | ..... | ..... | |
| 9,200 | 46,000 | .016333 | .002333 | ..... | ..... | |
| 9,600 | 48,000 | .018500 | .002167 | ..... | ..... | |
| 10,000 | 50,000 | .020700 | .002200 | ..... | ..... | |
| 10,800 | 54,000 | .026000 | .005300 | ..... | ..... | |
| 11,600 | 58,000 | .032833 | .006833 | ..... | ..... | |
| 12,400 | 62,000 | .039333 | .006500 | ..... | ..... | |
| 13,200 | 66,000 | .049667 | .010334 | ..... | ..... | |
| 15,570 | 77,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,850 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .2333 |
| Elongation per inch under strain at elastic limit | do... | .001333 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 87.1 |
| Position of rupture | | 1".5 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".20, ".33*, ".17 |

## Piece of Bar Forged and Subsequently Annealed.

### No. 6416.

Marks, R C 1 F.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .000967 | .000334 | 0. | ..... | |
| 7,000 | 35,000 | .001167 | .000200 | ..... | ..... | |
| 7,200 | 36,000 | .001200 | .000033 | ..... | ..... | |
| 7,400 | 37,000 | .001233 | .000033 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .020667 | .019434 | ..... | ..... | |
| 7,800 | 39,000 | .022000 | .001333 | ..... | ..... | |
| 8,000 | 40,000 | .023667 | .001667 | ..... | ..... | |
| 8,200 | 41,000 | .025733 | .002066 | ..... | ..... | |
| 8,400 | 42,000 | .027500 | .001767 | ..... | ..... | |
| 8,800 | 44,000 | .031667 | .004167 | ..... | ..... | |
| 9,200 | 46,000 | .035667 | .004000 | ..... | ..... | |
| 9,600 | 48,000 | .041333 | .005666 | ..... | ..... | |
| 10,000 | 50,000 | .047000 | .005667 | ..... | ..... | |
| 10,800 | 54,000 | .060000 | .013000 | ..... | ..... | |
| 12,690 | 63,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 63,450 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .3000 |
| Elongation per inch under strain at elastic limit | do... | .001233 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".22, ".46*, ".22 |

## From Receiver Forging, Forged and Annealed.

### No. 6439.

**Marks, R F.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 3".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000133 | .000133 | ..... | ..... | |
| 2,000 | 10,000 | .000300 | .000167 | ..... | ..... | |
| 4,000 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000367 | ..... | ..... | Elastic limit. |
| | | .012667 | .011667 | ..... | ..... | |
| 6,200 | 31,000 | .014333 | .001666 | ..... | ..... | |
| 6,400 | 32,000 | .015000 | .000667 | ..... | ..... | |
| 6,600 | 33,000 | .016833 | .001833 | ..... | ..... | |
| 6,800 | 34,000 | .018333 | .001500 | ..... | ..... | |
| 7,000 | 35,000 | .020000 | .001667 | ..... | ..... | |
| 7,200 | 36,000 | .021500 | .001500 | ..... | ..... | |
| 7,600 | 38,000 | .024667 | .003167 | ..... | ..... | |
| 8,000 | 40,000 | .030333 | .005666 | ..... | ..... | |
| 8,400 | 42,000 | .033667 | .003334 | ..... | ..... | |
| 8,800 | 44,000 | .039333 | .005666 | ..... | ..... | |
| 9,200 | 46,000 | .046000 | .006667 | ..... | ..... | |
| 9,600 | 48,000 | .052667 | .006667 | ..... | ..... | |
| 10,000 | 50,000 | .061333 | .008666 | ..... | ..... | |
| 11,970 | 59,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 59,850 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch.. | .3267 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".24, ".51*, ".23 |

*TABULATION OF TENSION SPECIMENS FROM STEEL FOR RECEIVERS OF RIFLES (LENGTH OF STEMS 3″).*

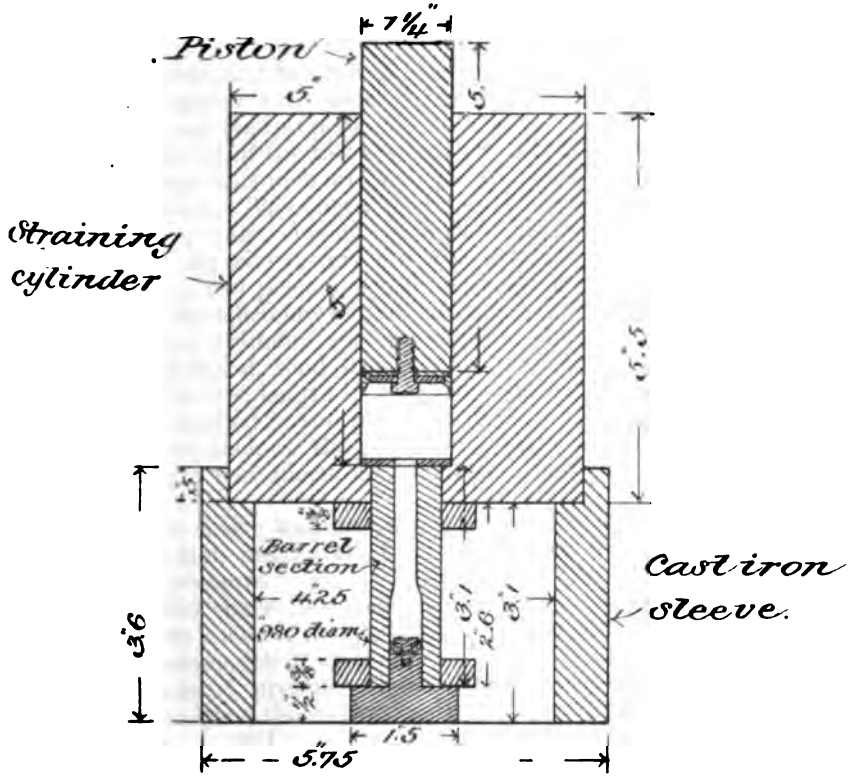
| No of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation in 3-inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | ″ ″ ″ | |
| 6085 | 37 R F 2.... | 0.505 | 0.20 | 42,000 | 81,100 | 25.7 | 49.1 | Silky | .16, .42*, .19 | |
| 6086 | 37 R 2..... | .505 | .20 | 45,000 | 76,000 | 28.3 | 51.9 | .....do | .20, .45*, .20 | |
| 6315 | 38 R ..... | .505 | .20 | 45,000 | 90,850 | 24.0 | 46.2 | Fine silky | .18, .37*, .17 | |
| 6316 | 38 R F..... | .505 | .20 | 47,000 | 86,600 | 21.0 | 37.1 | Silky, black spot in center of fractured surface ″.06 diameter; spongy at center. | .14, .19, .30* | |
| 6401 | R C..... | .505 | .20 | 36,000 | 59,700 | 33.3 | 59.8 | Fine silky, cup-shaped | .23, .54*, .23 | From bar. |
| 6402 | R C F..... | .505 | .20 | 52,000 | 80,550 | 23.7 | 40.3 | Fine silky, oblique; seam at center about ″.08 wide. | .31*, .24, .16 | Forged stock. |
| 6415 | R C 1 ..... | .505 | .20 | 39,000 | 77,850 | 23.3 | 37.1 | Silky | .20, .33*, .17 | From bar as received. |
| 6416 | R C 1 F..... | .505 | .20 | 37,000 | 68,450 | 30.0 | 49.1 | Fine silky | .22, .46*, .22 | Piece of bar forged and subsequently annealed. |
| 6439 | R F..... | .505 | .20 | 30,000 | 59,850 | 32.7 | 57.2 | .....do | .24, .51*, .23 | From receiver forging, forged and annealed. |

# RIFLE BARRELS, .30 CALIBER.

## HYDROSTATIC TESTS OF BREECH SECTIONS.

# Rifle Barrels, 30 caliber.

## Attachment for straining breech sections with hydrostatic pressure.



## HYDROSTATIC TESTS OF RIFLE BARRELS.

Tests were made on sections 3.1 inches long taken from the breech ends of twelve finished .30 caliber barrels.

Three different grades of metal are represented, one grade of which was tested both after the ordinary operation of forging and rifling and also after the metal as a final operation was oil tempered, so called, at the butt.

The oil tempering consisted of heating the butt end of the barrel and quenching the same by means of a stream of oil forced through the bore.

The apparatus used for applying pressure to the barrel sections, shown on the accompanying drawing, consisted of a straining cylinder having a bore 1¼ inches diameter mounted over the specimen and supported by a cast-iron sleeve.

The barrel section at the breech end was closed by a piston entering the powder chamber a distance of three-eighths of an inch, suitably packed with a cup leather packing.

The forward end of the test specimen entered the straining cylinder a distance of one-half inch and was packed by a flat leather washer covering the joint. The barrel section also carried two three-eighths inch reenforcing rings, shrunk on in their places.

The reinforcing rings were for the purpose of preventing such expansion of the test piece over the cup leather packing at one end as would destroy the efficiency of the packing, and at the other end injury to the straining cylinder was prevented. Incidentally these rings would, without doubt, tend to increase the apparent strength of the test piece. The free length of the latter was 1.85 inches.

Loads were applied to the piston of the straining cylinder, and the stress per square inch on the piston was taken as the pressure in the bore and on the test piece, no correction for packing friction being made.

The cast-iron sleeve was cut away on one side to permit of access to the barrel section during the test, which was measured after each increment of pressure.

The restricted space in which the measurements of the barrel section were taken made it inexpedient to record the results closer than the nearest thousandth of an inch.

Upon release of pressure the test pieces showed a resilience of ".001±; hence when the expansion in diameter exceeded this amount the excess represents the permanent expansion of the metal.

The elastic limits of the several barrels are thus shown to be below 40,750 pounds per square inch interior pressure.

## No. 9640.

### Section from Barrel Marked 75 S., Bessemer Steel.

Exterior diameter of section ".980.

Applied load on 1¼" piston, 75,000 pounds = 61,120 pounds per square inch pressure.

The maximum exterior diameter of the section of barrel after the test was ".994, thus showing a permanent extension of ".014.

## No. 9641.

### Section from Barrel Marked 49, Bessemer Steel

Exterior diameter ".980.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 44,820 | .992 | .012 | |
| 52,970 | 1.001 | .021 | |
| 59,480 | ..... | ..... | Maximum pressure reached. |
| 0 | 1.018 | .038 | Maximum diameter after testing, thus showing a permanent expansion of ".038. |

## No. 9642.

### Section from Barrel Marked 75 S. Oil Tempered at Butt.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .982 | 0. | Initial load. |
| 24,450 | .982 | 0. | Measurements under load were taken at middle of length of the barrel section. |
| 28,520 | .982+ | 0. | |
| 32,600 | .982+ | 0. | |
| 36,670 | .985 | .003 | |
| 38,710 | .987 | .005 | |
| 40,750 | .988 | .006 | |
| 44,820 | .991 | .009 | |
| 48,900 | .995 | .013 | |
| 52,970 | .999 | .017 | The diameter recorded after release of pressure was the maximum found and was taken near the threaded section. |
| 61,120 | 1.012 | .030 | |
| 0 | 1.018 | .031 | |

## No. 9643.

### Section from Barrel Marked 11, Bessemer Steel.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .981 | 0. | Initial load. |
| 24,450 | .981 | 0. | |
| 28,520 | .981 | 0. | |
| 32,600 | .982− | .001 | |
| 36,670 | .984 | .003 | |
| 38,710 | .986 | .005 | |
| 40,750 | .988 | .007 | |
| 16,300 | .987 | .006 | |
| 42,790 | .989 | .008 | |
| 44,820 | .991 | .010 | |
| 46,860 | .992 | .011 | |
| 48,900 | .994 | .013 | |
| 16,300 | .993 | .012 | |
| 52,970 | .998 | .017 | |
| 57,050 | 1.002 | .021 | |
| 61,120 | 1.009 | .028 | |
| 16,300 | 1.007 | .026 | |
| 61,120 | 1.010 | .029 | |
| 16,300 | 1.008 | .027 | |
| 0 | 1.008 | .027 | |

## No. 9644.

### Section from Barrel Marked 75 S.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .980+ | 0. | Initial load. |
| 24,450 | .981− | 0. | |
| 28,520 | .981− | .001 | |
| 32,600 | .981 | .001 | |
| 36,670 | .982 | .002 | |
| 38,710 | .983+ | .003 | |
| 40,750 | .985 | .005 | |
| 16,300 | .984 | .004 | |
| 42,790 | .986+ | .006 | |
| 44,820 | .988 | .008 | |
| 46,900 | .991 | .011 | |
| 16,300 | .990 | .010 | |
| 52,970 | .994 | .014 | |
| 57,050 | .997 | .017 | |
| 61,120 | 1.002 | .022 | |
| 16,300 | 1.001− | .021 | |
| 0 | 1.001 | .021 | |

## No. 9645.

### Section from Barrel Marked 11.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inch.* | *Inch.* | |
| 16,300 | .981 | 0. | Initial load. |
| 24,450 | .981 | 0. | |
| 28,520 | .981 | 0. | |
| 32,600 | .982 | .001 | |
| 36,670 | .984 | .003 | |
| 38,710 | .985 | .004 | |
| 40,750 | .986 | .005 | |
| 16,300 | .985+ | .004 | |
| 42,790 | .987 | .006 | |
| 44,820 | .989 | .008 | |
| 46,860 | .990 | .009 | |
| 48,900 | .993 | .012 | |
| 16,300 | .992 | .011 | |
| 52,970 | .996 | .015 | |
| 57,050 | .999 | .018 | |
| 61,120 | | | |
| 0 | 1.003 | .022 | |

## No. 9646.

### Section from Barrel Marked 49.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .981 | 0. | Initial load. |
| 24,450 | .981+ | 0. | |
| 28,520 | .982 | .001 | |
| 32,600 | .982 | .001 | |
| 36,670 | .984 | .003 | |
| 38,710 | .986 | .005 | |
| 40,750 | .987 | .006 | |
| 16,300 | .986 | .005 | |
| 42,790 | .989 | .008 | |
| 44,820 | .991 | .010 | |
| 48,900 | .995 | .014 | |
| 52,970 | .998 | .017 | |
| 57,050 | 1.006 | .025 | |
| 61,120 | 1.010 | .029 | |
| 16,300 | 1.009 | .028 | |

## No. 9647.

### Section from Barrel Marked 75 S, Oil-Tempered at Butt.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .981 | 0. | Initial load. |
| 24,450 | .981 | 0. | |
| 28,520 | .981+ | 0. | |
| 32,600 | .982 | .001 | |
| 34,640 | .982 | .001 | |
| 36,670 | .983 | .002 | |
| 38,710 | .986 | .005 | |
| 40,750 | .988− | .007 | |
| 16,300 | .987− | .006 | |
| 42,790 | .989 | .008 | |
| 44,820 | .990+ | .009 | |
| 48,900 | .993 | .012 | |
| 52,970 | .996 | .015 | |
| 57,050 | 1.003 | .022 | |
| 61,120 | 1.007− | .026 | |
| 16,300 | 1.006+ | .024 | |

## No. 9648.

### Section from Barrel Marked 75 S.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .981 | 0. | Initial load. |
| 24,450 | .981 | 0. | |
| 28,520 | .981+ | 0. | |
| 32,600 | .982 | .001 | |
| 34,640 | .983 | .002 | |
| 36,670 | .984 | .003 | |
| 38,710 | .986 | .005 | |
| 40,750 | .987 | .006 | |
| 16,300 | .986 | .005 | |
| 42,790 | .989 | .008 | |
| 44,820 | .991 | .010 | |
| 48,900 | .994 | .013 | |
| 52,970 | .998+ | .017 | |
| 57,050 | 1.004 | .023 | |
| 61,120 | 1.009+ | .028 | |
| 16,300 | 1.008 | .027 | |
| 0 | 1.008 | .027 | |

## No. 9649.

### Section from Barrel Marked 49.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .980 | 0. | Initial load. |
| 24,450 | .980 | 0. | |
| 28,520 | .980+ | 0. | |
| 32,600 | .981− | .001 | |
| 34,640 | .982− | .002 | |
| 36,670 | .983 | .003 | |
| 38,710 | .985 | .005 | |
| 40,750 | .986 | .006 | |
| 16,300 | .985 | .005 | |
| 42,790 | .988 | .008 | |
| 44,820 | .989 | .009 | |
| 48,900 | .993− | .013 | |
| 52,970 | .996+ | .016 | |
| 57,050 | 1.001 | .021 | |
| 61,120 | 1.009+ | .029 | |
| 16,300 | 1.008− | .028 | |

## No. 9650.

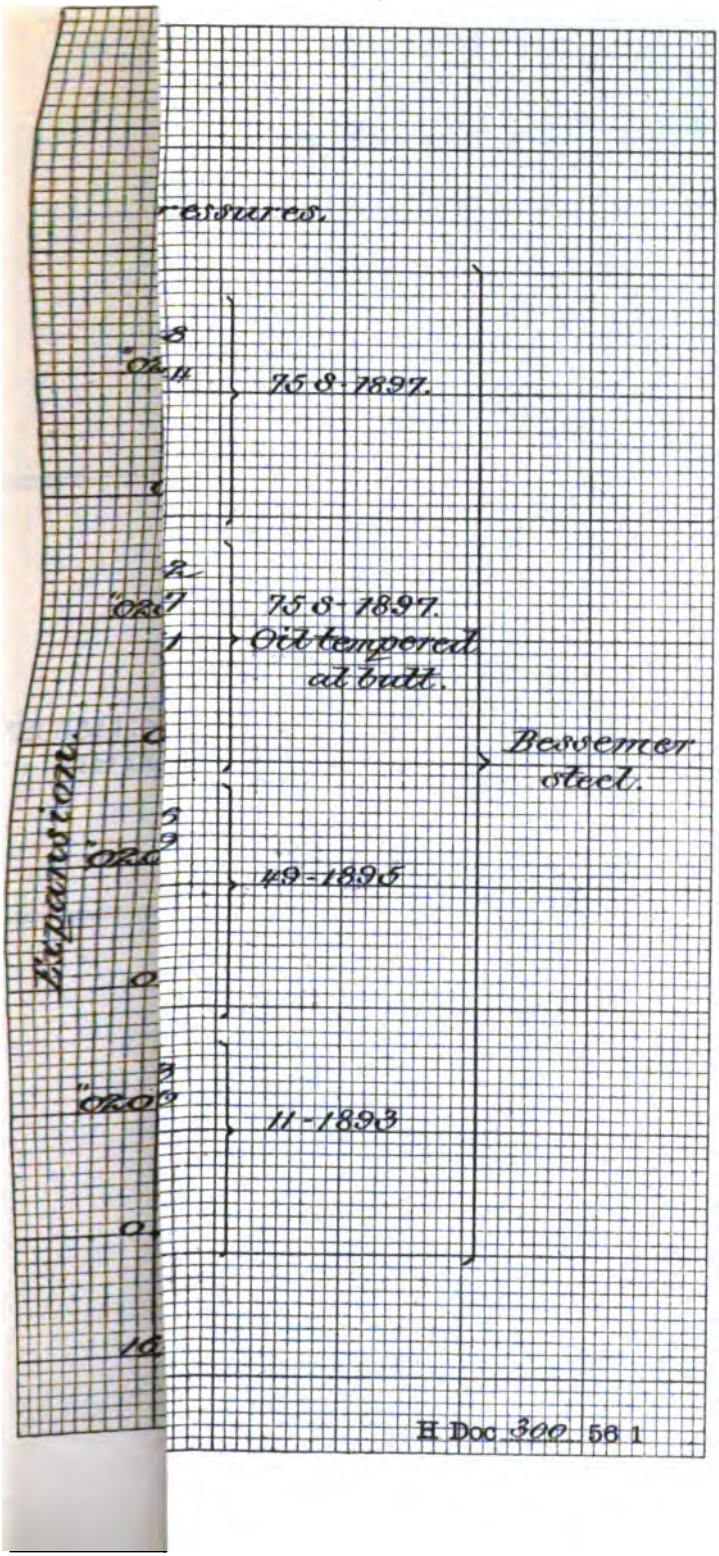
### Section from Barrel Marked 11.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .980 | 0. | Initial load. |
| 24,450 | .980 | 0. | |
| 28,520 | .980+ | 0. | |
| 32,600 | .981 | .001 | |
| 34,640 | .983− | .003 | |
| 36,670 | .984 | .004 | |
| 38,710 | .985 | .005 | |
| 40,750 | .987 | .007 | |
| 16,300 | .986 | .006 | |
| 42,790 | .988 | .008 | |
| 44,820 | .990 | .010 | |
| 48,900 | .993 | .013 | |
| 52,970 | .997 | .017 | |
| 57,050 | 1.004 | .024 | |
| 61,120 | 1.006+ | .026 | |
| 16,300 | 1.005 | .025 | |

## No. 9651.

### Section from Barrel Marked 75 S, Oil-Tempered at Butt.

| Pressure per square inch. | Barrel section. | | Remarks. |
|---|---|---|---|
| | Diameter. | Expansion. | |
| *Pounds.* | *Inches.* | *Inch.* | |
| 16,300 | .980 | 0. | Initial load. |
| 24,450 | .980+ | 0. | |
| 28,520 | .980+ | 0. | |
| 32,600 | .981 | .001 | |
| 34,640 | .981 | .001 | |
| 36,670 | .981 | .001 | |
| 38,710 | .982– | .002 | |
| 40,750 | .983– | .003 | |
| 16,300 | .982– | .002 | |
| 42,790 | .984 | .004 | |
| 44,820 | .985+ | .005 | |
| 46,860 | .987 | .007 | |
| 48,900 | .989 – | .009 | |
| 52,970 | .992 | .012 | |
| 57,050 | .995 | .015 | |
| 61,120 | .998+ | .018 | |
| 16,300 | .997 | .017 | |


resources.
75 8-1897.
75 8-1897.
Oil tempered at butt.
Bessemer steel.
49-1895
11-1893
Expansion.
H Doc 300 58 1

# STEEL FOR GUN MOUNTS.

SPECIMENS FROM PIVOT SOCKETS, INNER BASES, PISTON RODS, AND AXLE FOR 6-POUNDER AND 15-POUNDER MOUNTS.

# PIVOT SOCKETS—6-POUNDER GUN MOUNTS.

## STEEL CASTINGS.

## No. 6170.

**Marks,** $\frac{A\text{-}2}{P\,S\,6}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | ..... | ..... | |
| 2,000 | 10,000 | .000300 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000950 | .000450 | .000800 | .000800 | |
| 4,200 | 21,000 | .001600 | .000650 | ..... | ..... | |
| 4,400 | 22,000 | .002100 | .000500 | ..... | ..... | |
| 4,600 | 23,000 | .003550 | .001450 | ..... | ..... | |
| 4,800 | 24,000 | .004500 | .000950 | ..... | ..... | |
| 5,000 | 25,000 | .005700 | .001200 | ..... | ..... | |
| 5,200 | 26,000 | .006750 | .001050 | ..... | ..... | |
| 5,400 | 27,000 | .008000 | .001250 | ..... | ..... | |
| 5,600 | 28,000 | .009250 | .001250 | ..... | ..... | |
| 5,800 | 29,000 | .010650 | .001400 | ..... | ..... | |
| 6,000 | 30,000 | .012500 | .001850 | .011400 | .011100 | |
| 10,890 | 54,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| **Tensile strength** per square inch of original section | pounds.. | 54,450 |
| **Elastic limit** per square inch of original section | below | 20,00 pounds |
| **Elongation** per inch after rupture | inch.. | .1350 |
| **Reduction** in diameter at point of rupture | do... | .045 |
| **Reduction** in area after rupture, per cent of original section | | 16.9 |
| **Position** of rupture | | ".60 from neck |
| **Character** of broken surface | | granular, dark spot at circumference |
| **Elongation** of inch sections | | ".12, ".15* |

## No. 6219.

Marks, $\frac{A\ 6}{P\ S\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 4,200 | 21,000 | .000750 | .000100 | ..... | ..... | Elastic limit. |
| 4,400 | 22,000 | .001250 | .000500 | ..... | ..... | |
| 4,600 | 23,000 | .002500 | .001250 | ..... | ..... | |
| 4,800 | 24,000 | .003700 | .001200 | ..... | ..... | |
| 5,000 | 25,000 | .004900 | .001200 | ..... | ..... | |
| 5,200 | 26,000 | .005950 | .001050 | ..... | ..... | |
| 5,400 | 27,000 | .007500 | .001550 | ..... | ..... | |
| 5,600 | 28,000 | .008600 | .001100 | ..... | ..... | |
| 5,800 | 29,000 | .010000 | .001400 | ..... | ..... | |
| 6,000 | 30,000 | .011450 | .001450 | ..... | ..... | |
| 11,640 | 58,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 58,200 |
| Elastic limit per square inch of original section | do... | 21,000 |
| Elongation per inch after rupture | inch.. | .3000 |
| Elongation per inch under strain at elastic limit | do... | .000750 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | dull, silky |
| Elongation of inch sections | | ".32*, ".28* |

## No. 6220.

Marks, $\frac{A\,7}{P\,8\,6}$
Diameter, ".504.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000550 | .000200 | ..... | ..... | |
| 3,800 | 19,000 | .000700 | .000150 | ..... | ..... | Elastic limit. |
| 4,000 | 20,000 | .000950 | .000250 | ..... | ..... | |
| 4,200 | 21,000 | .001100 | .000150 | ..... | ..... | |
| 4,400 | 22,000 | .001600 | .000500 | ..... | ..... | |
| 4,600 | 23,000 | .002550 | .000950 | ..... | ..... | |
| 4,800 | 24,000 | .003500 | .000950 | ..... | ..... | |
| 5,000 | 25,000 | .004900 | .001400 | ..... | ..... | |
| 5,200 | 26,000 | .006100 | .001200 | ..... | ..... | |
| 5,400 | 27,000 | .007500 | .001400 | ..... | ..... | |
| 5,600 | 28,000 | .008750 | .001250 | ..... | ..... | |
| 5,800 | 29,000 | .010100 | .001350 | ..... | ..... | |
| 6,000 | 30,000 | .011750 | .001650 | ..... | ..... | |
| 11,560 | 57,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 57,800 |
| Elastic limit per square inch of original section | do... | 19,000 |
| Elongation per inch after ruture | inch.. | .2600 |
| Elongation per inch under strain at elastic limit | do... | .000700 |
| Reduction in diameter at point of rupture | do... | .104 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | dull, silky |
| Elongation of inch sections | | ".21, ".31* |

## No. 6221.

Marks, $\frac{A-8}{P\ S\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2 000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .000800 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000200 | 0. | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000200 | ..... | ..... | |
| 8,200 | 41,000 | .001400 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | ..... | ..... | |
| 8,600 | 43,000 | .001550 | .000100 | ..... | ..... | Elastic limit. |
| 8,800 | 44,000 | .002100 | .000550 | ..... | ..... | |
| 9,000 | 45,000 | .003450 | .001350 | ..... | ..... | |
| 9,200 | 46,000 | .005100 | .001650 | ..... | ..... | |
| 9,400 | 47,000 | .006150 | .001050 | ..... | ..... | |
| 9,600 | 48,000 | .007000 | .000850 | ..... | ..... | |
| 9,800 | 49,000 | .007600 | .000600 | ..... | ..... | |
| 10,000 | 50,000 | .008450 | .000850 | ..... | ..... | |
| 19,920 | 99,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 99,600 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | granular, dull spot at the circumference. Opened cracks in surface of stem. |
| Elongation of inch sections | | ".11*, ".11 |

## No. 6222.

**Marks,** $\frac{A-9}{P\ S\ 6}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000600 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000200 | ..... | ..... | Elastic limit. |
| 4,200 | 21,000 | .000850 | .000150 | ..... | ..... | |
| 4,400 | 22,000 | .000950 | .000100 | ..... | ..... | |
| 4,600 | 23,000 | .001400 | .000450 | ..... | ..... | |
| 4,800 | 24,000 | .002100 | .000700 | ..... | ..... | |
| 5,000 | 25,000 | .003100 | .001000 | ..... | ..... | |
| 5,200 | 26,000 | .004750 | .001650 | ..... | ..... | |
| 5,400 | 27,000 | .005800 | .001050 | ..... | ..... | |
| 5,600 | 28,000 | .006500 | .000700 | ..... | ..... | |
| 5,800 | 29,000 | .007650 | .001150 | ..... | ..... | |
| 6,000 | 30,000 | .009000 | .001350 | ..... | ..... | |
| 12,030 | 60,150 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 60,150 |
| Elastic limit per square inch of original section | do... | 20,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .000700 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | dull amorphous |
| Elongation of inch sections | | ".25*, ".20 |

## No. 6223.

Marks, $\frac{A-10}{P\ S\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | ..... | |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000750 | .000250 | ..... | ..... | |
| 4,200 | 21,000 | .000850 | .000100 | ..... | ..... | Elastic limit. |
| 4,400 | 22,000 | .001000 | .000150 | ..... | ..... | |
| 4,600 | 23,000 | .001400 | .000400 | ..... | ..... | |
| 4,800 | 24,000 | .002000 | .000600 | ..... | ..... | |
| 5,000 | 25,000 | .002900 | .000900 | ..... | ..... | |
| 5,200 | 26,000 | .004150 | .001250 | ..... | ..... | |
| 5,400 | 27,000 | .005300 | .001150 | ..... | ..... | |
| 5,600 | 28,000 | .006500 | .001200 | ..... | ..... | |
| 5,800 | 29,000 | .007650 | .001150 | ..... | ..... | |
| 6,000 | 30,000 | .009000 | .001350 | ..... | ..... | |
| 19,980 | 99,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 99,900 |
| Elastic limit per square inch of original section | do... | 21,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | dull silky, trace of granulation |
| Elongation of inch sections | | ".18, ".24 |

## No. 6224.

Marks, $\frac{A-11}{P\ S\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | Elastic limit. |
| 4,200 | 21,000 | .000850 | .000200 | ..... | ..... | |
| 4,400 | 22,000 | .001000 | .000150 | ..... | ..... | |
| 4,600 | 23,000 | .001500 | .000500 | ..... | ..... | |
| 4,800 | 24,000 | .002150 | .000650 | ..... | ..... | |
| 5,000 | 25,000 | .003000 | .000850 | ..... | ..... | |
| 5,200 | 26,000 | .004150 | .001150 | ..... | ..... | |
| 5,400 | 27,000 | .005500 | .001350 | ..... | ..... | |
| 5,600 | 28,000 | .006550 | .001050 | ..... | ..... | |
| 5,800 | 29,000 | .007750 | .001200 | ..... | ..... | |
| 6,000 | 30,000 | .009200 | .001450 | ..... | ..... | |
| 12,110 | 60,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 60,550 |
| Elastic limit per square inch of original section | do... | 20,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .000650 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | dull amorphous |
| Elongation of inch sections | | ".20, ".28* |

## No. 6225.

Marks, $\frac{A-12}{P\ S\ 6}$
Diameter, ".504.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive Elongation per inch. | Permanent set. | Successive Permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | Elastic limit. |
| 4,200 | 21,000 | .000850 | .000250 | ..... | ..... | |
| 4,400 | 22,000 | .001100 | .000250 | ..... | ..... | |
| 4,600 | 23,000 | .001650 | .000550 | ..... | ..... | |
| 4,800 | 24,000 | .002450 | .000800 | ..... | ..... | |
| 5,000 | 25,000 | .003550 | .001100 | ..... | ..... | |
| 5,200 | 26,000 | .004700 | .001150 | ..... | ..... | |
| 5,400 | 27,000 | .005850 | .001150 | ..... | ..... | |
| 5,600 | 28,000 | .007000 | .001150 | ..... | ..... | |
| 5,800 | 29,000 | .008250 | .001250 | ..... | ..... | |
| 6,000 | 30,000 | .009300 | .001050 | ..... | ..... | |
| 11,970 | 59,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 59,850 |
| Elastic limit per square inch of original section | do... | 20,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .000600 |
| Reduction in diameter at point of rupture | do... | .074 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | dull amorphous |
| Elongation of inch sections | | ".18, ".25* |

## No. 6237.

Marks, $\frac{A-13}{P\ S\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 3,000 | 15,000 | .000600 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000150 | ..... | ..... | Elastic limit. |
| 5,200 | 26,000 | .000950 | .000100 | ..... | ..... | |
| 5,400 | 27,000 | .011550 | .010600 | ..... | ..... | |
| 5,600 | 28,000 | .013500 | .001950 | ..... | ..... | |
| 5,800 | 29,000 | .014600 | .001100 | ..... | ..... | |
| 6,000 | 30,000 | .016750 | .002150 | ..... | ..... | |
| 11,080 | 55,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 55,400 |
| Elastic limit per square inch of original section | do... | 25,000 |
| Elongation per inch after rupture | inch.. | .3500 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .165 |
| Reduction in area after rupture, per cent of original section | | 54.6 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".42*, ".28 |

## No. 6238.

Marks, $\frac{A\ 14}{P\ S\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000250 | ..... | ..... | |
| 5,000 | 25,000 | .000800 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000200 | ..... | ..... | |
| 6,200 | 31,000 | .001050 | .000050 | ..... | ..... | |
| 6,400 | 32,000 | .001050 | 0. | ..... | ..... | |
| 6,600 | 33,000 | .001100 | .000050 | ..... | ..... | Elastic limit. |
| 6,800 | 34,000 | .002000 | .000900 | ..... | ..... | |
| 7,000 | 35,000 | .022900 | .020900 | ..... | ..... | |
| 7,200 | 36,000 | .024500 | .001600 | ..... | ..... | |
| 7,400 | 37,000 | .026650 | .002150 | ..... | ..... | |
| 7,600 | 38,000 | .028600 | .001950 | ..... | ..... | |
| 7,800 | 39,000 | .031400 | .002800 | ..... | ..... | |
| 8,000 | 40,000 | .034000 | .003600 | ..... | ..... | |
| 11,910 | 59,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | *59,550* |
| Elastic limit per square inch of original section | do... | 33,000 |
| Elongation per inch after rupture | inch.. | .3500 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | | 59.8 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".31, ".39* |

## No. 6239.

Marks, $\frac{A\ 15}{P\ 8\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000300 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | ..... | ..... | |
| 6,200 | 31,000 | .001050 | .000050 | ..... | ..... | Elastic limit. |
| 6,400 | 32,000 | .011150 | .010100 | ..... | ..... | |
| 6,600 | 33,000 | .012250 | .001100 | ..... | ..... | |
| 6,800 | 34,000 | .013050 | .000800 | ..... | ..... | |
| 7,000 | 35,000 | .014250 | .001200 | ..... | ..... | |
| 7,200 | 36,000 | .015750 | .001500 | ..... | ..... | |
| 7,400 | 37,000 | .017250 | .001500 | ..... | ..... | |
| 7,600 | 38,000 | .018250 | .001000 | ..... | ..... | |
| 7,800 | 39,000 | .019650 | .001400 | ..... | ..... | |
| 8,000 | 40,000 | .021850 | .002200 | ..... | ..... | |
| 13,220 | 66,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 66,100 |
| Elastic limit per square inch of original section | do... | 31,000 |
| Elongation per inch after rupture | inch.. | .2550 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".30*, ".21 |

## No. 6240.

Marks, $\frac{A-16}{P\ S\ 6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000250 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000350 | ..... | ..... | |
| 5,400 | 27,000 | .001050 | .000050 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .015000 | .013950 | ..... | ..... | |
| 5,800 | 29,000 | .016250 | .001250 | ..... | ..... | |
| 6,000 | 30,000 | .017750 | .001500 | ..... | ..... | |
| 6,200 | 31,000 | .019500 | .001750 | ..... | ..... | |
| 6,400 | 32,000 | .021550 | .002050 | ..... | ..... | |
| 6,600 | 33,000 | .024000 | .002450 | ..... | ..... | |
| 6,800 | 34,000 | .026250 | .002250 | ..... | ..... | |
| 7,000 | 35,000 | .028800 | .002550 | ..... | ..... | |
| 10,920 | 54,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 54,600 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .3700 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | 1″.26 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.31, ″.43* |

## No. 6241.

Marks, $\frac{A\text{-}17}{PS6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000450 | ..... | ..... | |
| 6,200 | 31,000 | .001050 | .000050 | ..... | ..... | Elastic limit. |
| 6,400 | 32,000 | .013250 | .012200 | ..... | ..... | |
| 6,600 | 33,000 | .014050 | .000800 | ..... | ..... | |
| 6,800 | 34,000 | .015300 | .001250 | ..... | ..... | |
| 7,000 | 35,000 | .017050 | .001750 | ..... | ..... | |
| 7,200 | 36,000 | .018900 | .001850 | ..... | ..... | |
| 7,400 | 37,000 | .020550 | .001650 | ..... | ..... | |
| 7,600 | 38,000 | .022400 | .001850 | ..... | ..... | |
| 7,800 | 39,000 | .024600 | .002200 | ..... | ..... | |
| 8,000 | 40,000 | .026600 | .002000 | ..... | ..... | |
| 12,180 | 60,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 60,900 |
| Elastic limit per square inch of original section | do... | 31,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".5 from neck |
| Character of broken surface | | dull gray, amorphous |
| Elongation of inch sections | | ".17, ".26* |

## No. 6242.

Marks, $\frac{A-18}{P\,S\,6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | ..... | ..... | Elastic limit. |
| 6,200 | 31,000 | .011050 | .010100 | ..... | ..... | |
| 6,400 | 32,000 | .011950 | .000900 | ..... | ..... | |
| 6,600 | 33,000 | .013000 | .001050 | ..... | ..... | |
| 6,800 | 34,000 | .014500 | .001500 | ..... | ..... | |
| 7,000 | 35,000 | .015800 | .001300 | ..... | ..... | |
| 12,210 | 61,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 61,050 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .000950 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ″.9 from neck |
| Character of broken surface | | dull gray, amorphous |
| Elongation of inch sections | | ″.19, ″.23* |

## No. 6275.

Marks, $\frac{A\text{-}19}{P\ S\ 6}$.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000100 | 0. | ..... | |
| 5,000 | 25,000 | .000750 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000250 | 0. | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | Elastic limit. |
| 7,200 | 36,000 | .001500 | .000300 | ..... | ..... | |
| 7,400 | 37,000 | .012250 | .010750 | ..... | ..... | |
| 7,600 | 38,000 | .013500 | .001250 | ..... | ..... | |
| 7,800 | 39,000 | .014500 | .001000 | ..... | ..... | |
| 8,000 | 40,000 | .015500 | .001000 | ..... | ..... | |
| 14,100 | 70,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 70,500 |
| Elastic limit per square inch of original section | do... | 35,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001200 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky, serrated |
| Elongation of inch sections | | ".25*, ".20 |

## No. 6276.

Marks, $\frac{A\text{-}20}{P\,S\,6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000150 | 0. | ..... | |
| 7,000 | 35,000 | .001300 | .000250 | ..... | ..... | |
| 7,200 | 36,000 | .001400 | .000100 | ..... | ..... | |
| 7,400 | 37,000 | .001450 | .000050 | ..... | ..... | |
| 7,600 | 38,000 | .001500 | .000050 | ..... | ..... | |
| 7,800 | 39,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .013500 | .011950 | ..... | ..... | |
| 8,200 | 41,000 | .014400 | .000900 | ..... | ..... | |
| 8,400 | 42,000 | .015900 | .001500 | ..... | ..... | |
| 8,600 | 43,000 | .016850 | .000950 | ..... | ..... | |
| 8,800 | 44,000 | .017900 | .001050 | ..... | ..... | |
| 9,000 | 45,000 | .019150 | .001250 | ..... | ..... | |
| 14,850 | 74,250 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 74,250 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1700 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | granular 60 per cent, silky 40 per cent |
| Elongation of inch sections | | ".19*, ".15 |

## No. 6298.

Marks, $\frac{A-21}{P\ 86}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 4,200 | 21,000 | .000750 | .000100 | ..... | ..... | |
| 4,400 | 22,000 | .000850 | .000100 | ..... | ..... | |
| 4,600 | 23,000 | .000900 | .000050 | ..... | ..... | |
| 4,800 | 24,000 | .001000 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .001100 | .000100 | .000300 | .000300 | Elastic limit, approximate. |
| 5,200 | 26,000 | .001500 | .000400 | ..... | ..... | |
| 5,400 | 27,000 | .002250 | .000750 | ..... | ..... | |
| 5,600 | 28,000 | .003500 | .001250 | ..... | ..... | |
| 5,800 | 29,000 | .004300 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .005500 | .001200 | ..... | ..... | |
| 13,440 | 67,200 | ..... | ..... | ..... | ..... | Tensile strength |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 67,200 |
| Elastic limit per square inch of original section (approximate) | do... | 25,000 |
| Elongation per inch after rupture | inch.. | .3000 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1".14 from neck |
| Character of broken surface | | dull, silky |
| Elongation of inch sections | | ".28, ".32* |

## No. 6299.

Marks, $\frac{A\ 22}{P\ S\ 6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000550 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000950 | .000250 | .000050 | .000050 | |
| 5,200 | 26,000 | .001000 | .000050 | ..... | ..... | Elastic limit. |
| 5,400 | 27,000 | .001150 | .000150 | ..... | ..... | |
| 5,600 | 28,000 | .001300 | .000150 | ..... | ..... | |
| 5,800 | 29,000 | .002400 | .001100 | ..... | ..... | |
| 6,000 | 30,000 | .002900 | .000500 | ..... | ..... | |
| 6,200 | 31,000 | .003850 | .000950 | ..... | ..... | |
| 6,400 | 32,000 | .004900 | .001050 | ..... | ..... | |
| 6,600 | 33,000 | .005600 | .000700 | ..... | ..... | |
| 6,800 | 34,000 | .006450 | .000850 | ..... | ..... | |
| 7,000 | 35,000 | .007250 | .000800 | ..... | ..... | |
| 14,710 | 73,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 73,550 |
| Elastic limit per square inch of original section | do... | 26,000 |
| Elongation per inch after rupture | inch.. | .1950 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1″ from neck |
| Character of broken surface | | granular, silky spot at the circumference |
| Elongation of inch sections | | ″.21*, ″.18 |

# PISTON RODS—6-POUNDER GUN MOUNTS

## STEEL FORGINGS.

## No. 6202.

Marks, $\frac{A\text{-}1}{PR\,6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | 0. | ..... | |
| 10,200 | 51,000 | .001600 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .001650 | .000050 | ..... | ..... | |
| 12,000 | 60,000 | .002000 | .000350 | ..... | ..... | |
| 12,800 | 64,000 | .002650 | .000650 | ..... | ..... | Elastic limit. |
| 13,000 | 65,000 | .006650 | .004000 | ..... | ..... | |
| 13,200 | 66,000 | .007000 | .000350 | ..... | ..... | |
| 13,400 | 67,000 | .007300 | .000300 | ..... | ..... | |
| 13,600 | 68,000 | .007600 | .000300 | ..... | ..... | |
| 13,800 | 69,000 | .008250 | .000650 | ..... | ..... | |
| 14,000 | 70,000 | .008500 | .000250 | ..... | ..... | |
| 16,310 | 81,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 81,550 |
| Elastic limit per square inch of original section | do... | 64,000 |
| Elongation per inch after rupture | inch.. | .1000 |
| Elongation per inch under strain at elastic limit | do... | .002650 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ".10*, ".10* |

## No. 6198.

Marks, $\frac{A\text{-}2}{P\ R\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000300 | 0. | ..... | |
| 10,000 | 50,000 | .001600 | .000300 | ..... | ..... | |
| 12,000 | 60,000 | .002000 | .000400 | ..... | ..... | |
| 12,200 | 61,000 | .002050 | .000050 | ..... | ..... | |
| 12,400 | 62,000 | .002100 | .000050 | ..... | ..... | Elastic limit. |
| 12,600 | 63,000 | .014000 | .011900 | ..... | ..... | |
| 12,800 | 64,000 | .014650 | .000650 | ..... | ..... | |
| 13,000 | 65,000 | .014900 | .000250 | ..... | ..... | |
| 13,200 | 66,000 | .015200 | .000300 | ..... | ..... | |
| 13,400 | 67,000 | .015850 | .000650 | ..... | ..... | |
| 21,100 | 105,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 105,500 |
| Elastic limit per square inch of original section | do... | 62,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .002100 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | 1 ".06 from neck |
| Character of broken surface | | fine granular radiating from the center |
| Elongation of inch sections | | ".11*, ".11 |

No. 6297.

**Marks,** $\frac{A\ 3}{P\ R\ 6}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001850 | .000850 | 0. | ..... | |
| 10,000 | 50,000 | .001700 | .000850 | ..... | ..... | |
| 12,000 | 60,000 | .002050 | .000350 | ..... | ..... | |
| 13,000 | 65,000 | .002300 | .000250 | ..... | ..... | Elastic limit. |
| 13,200 | 66,000 | .010650 | .008350 | ..... | ..... | |
| 13,400 | 67,000 | .011500 | .000850 | ..... | ..... | |
| 13,600 | 68,000 | .012100 | .000600 | ..... | ..... | |
| 13,800 | 69,000 | .012300 | .000200 | ..... | ..... | |
| 14,000 | 70,000 | .012600 | .000300 | ..... | ..... | |
| 24,020 | 120,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 120,100 |
| Elastic limit per square inch of original section | do... | 65,000 |
| Elongation per inch after rupture | inch.. | .0950 |
| Elongation per inch under strain at elastic limit | do... | .002300 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine granular, radiating from center punch mark defining inch section on stem. |
| Elongation of inch sections | | ".10*, ".09* |

## No. 6305.

Marks, $\frac{A\ 4}{P.R.6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | 0. | ..... | |
| 8,200 | 41,000 | .001400 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001450 | .000050 | ..... | ..... | |
| 8,600 | 43,000 | .001550 | .000100 | ..... | ..... | |
| 8,800 | 44,000 | .001600 | .000050 | ..... | ..... | Elastic limit. |
| 9,000 | 45,000 | .006750 | .005150 | ..... | ..... | |
| 9,200 | 46,000 | .007250 | .000500 | ..... | ..... | |
| 9,400 | 47,000 | .007850 | .000600 | ..... | ..... | |
| 9,600 | 48,000 | .008300 | .000450 | ..... | ..... | |
| 9,800 | 49,000 | .009150 | .000850 | ..... | ..... | |
| 20,200 | 101,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 101,000 |
| Elastic limit per square inch of original section | do... | 44.000 |
| Elongation per inch after rupture | inch.. | .1400 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ″.5 from neck |
| Character of broken surface | | fine granular, with a circle of coarser granulation ¼″ diameter |
| Elongation of inch sections | | ″.10 ″.18* |

## No. 6334.

**Marks,** $\frac{A\ 5}{PR\ 6}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000850 | .000850 | 0. | ..... | |
| 8,000 | 40,000 | .001200 | .000250 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | .000400 | ..... | ..... | |
| 12,000 | 60,000 | .002050 | .000450 | ..... | ..... | Elastic limit. |
| 12,200 | 61,000 | .009850 | .007300 | ..... | ..... | |
| 12,400 | 62,000 | .009750 | .000400 | ..... | ..... | |
| 12,600 | 63,000 | .010050 | .000300 | ..... | ..... | |
| 12,800 | 64,000 | .010500 | .000450 | ..... | ..... | |
| 13,000 | 65,000 | .011000 | .000500 | ..... | ..... | |
| 23,800 | 119,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds.. | 119,000 |
| Elastic limit, per square inch of original section | do... | 60,000 |
| Elongation per inch after rupture | inch.. | .0950 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".65 from neck |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ".08, ".11* |

## No. 6354.

Marks, $\overset{A\,6}{P\,R\,6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,000 | 5,000 | .000050 | .000050 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | ..... | ..... | |
| 9,000 | 45,000 | .001550 | .000250 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .002250 | .000700 | ..... | ..... | |
| 9,400 | 47,000 | .002600 | .000350 | ..... | ..... | |
| 9,600 | 48,000 | .003150 | .000550 | ..... | ..... | |
| 9,800 | 49,000 | .003500 | .000350 | ..... | ..... | |
| 10,000 | 50,000 | .004050 | .000550 | ..... | ..... | |
| 10,400 | 52,000 | .004600 | .000550 | ..... | ..... | |
| 10,800 | 54,000 | .005550 | .000950 | ..... | ..... | |
| 11,200 | 56,000 | .006200 | .000650 | ..... | ..... | |
| 11,600 | 58,000 | .007450 | .001250 | ..... | ..... | |
| 12,000 | 60,000 | .008500 | .001050 | ..... | ..... | |
| 22,810 | 114,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds | 114,050 |
| Elastic limit per square inch of original section | do | 45,000 |
| Elongation per inch after rupture | inch | .1150 |
| Elongation per inch under strain at elastic limit | do | .001550 |
| Reduction in diameter at point of rupture | do | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ″.85 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ″.13, ″.10 |

## No. 6367.

**Marks,** $\frac{A\,7}{P\,R\,6}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000850 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000850 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | 0. | ..... | |
| 10,000 | 50,000 | .001750 | .000850 | ..... | ..... | |
| 11,000 | 55,000 | .002000 | .000250 | ..... | ..... | |
| 11,200 | 56,000 | .002000 | .000050 | ..... | ..... | Elastic limit. |
| 11,400 | 57,000 | .008000 | .005950 | ..... | ..... | |
| 11,600 | 58,000 | .009150 | .001150 | ..... | ..... | |
| 11,800 | 59,000 | .010000 | .000850 | ..... | ..... | |
| 12,000 | 60,000 | .010500 | .000500 | ..... | ..... | |
| 12,200 | 61,000 | .011400 | .000900 | ..... | ..... | |
| 23,410 | 117,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 117,050 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture | inch.. | .1150 |
| Elongation per inch under strain at elastic limit | do... | .002050 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".55 from neck |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ".14*. ".09 |

## No. 6257.

Marks, $\frac{A-12}{P\ R\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000300 | ..... | ..... | |
| 5,600 | 28,000 | .001000 | .000100 | ..... | ..... | |
| 5,800 | 29,000 | .001050 | .000050 | ..... | ..... | Elastic limit. |
| 6,000 | 30,000 | .001500 | .000450 | ..... | ..... | |
| 6,200 | 31,000 | .003800 | .002100 | ..... | ..... | |
| 6,400 | 32,000 | 004950 | .001350 | ..... | ..... | |
| 6,600 | 33,000 | .005450 | .000500 | ..... | ..... | |
| 6,800 | 34,000 | .005900 | .000450 | ..... | ..... | |
| 7,000 | 35,000 | .006350 | .000450 | ..... | ..... | |
| 7,200 | 36,000 | .006850 | .000500 | ..... | ..... | |
| 7,400 | 37,000 | .007550 | .000700 | ..... | ..... | |
| 7,600 | 38,000 | .008000 | .000450 | ..... | ..... | |
| 7,800 | 39,000 | .008300 | .000300 | ..... | ..... | |
| 8,000 | 40,000 | .008600 | .000300 | ..... | ..... | |
| 16,680 | 83,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 83,400 |
| Elastic limit per square inch of original section | do... | 29,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | .10, .12 |

## No. 6386.

Marks, $\frac{A\ 21}{P\ R\ 6}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | ..... | ..... | |
| 9,000 | 45,000 | .001550 | .000200 | ..... | ..... | |
| 10,000 | 50,000 | .001800 | .000250 | ..... | ..... | Elastic limit. |
| | | .004750 | .002950 | ..... | ..... | |
| 10,200 | 51,000 | .006000 | .001250 | ..... | ..... | |
| 10,400 | 52,000 | .007400 | .001400 | ..... | ..... | |
| 10,600 | 53,000 | .007750 | .000850 | ..... | ..... | |
| 10,800 | 54,000 | .008350 | .000600 | ..... | ..... | |
| 11,000 | 55,000 | .009050 | .000700 | ..... | ..... | |
| 19,980 | 99,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 99,900 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".25*, ".17 |

## No. 6387.

Marks, $\frac{A\ 22}{P\ R\ 6}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | ..... | ..... | |
| 9,200 | 46,000 | .001650 | .000250 | ..... | ..... | |
| 9,400 | 47,000 | .001700 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001750 | .000050 | ..... | ..... | Elastic limit. |
| 9,800 | 49,000 | .004000 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .006900 | .002900 | ..... | ..... | |
| 10,200 | 51,000 | .007400 | .000500 | ..... | ..... | |
| 10,400 | 52,000 | .007850 | .000450 | ..... | ..... | |
| 10,600 | 53,000 | .008550 | .000700 | ..... | ..... | |
| 10,800 | 54,000 | .009000 | .000450 | ..... | ..... | |
| 11,000 | 55,000 | .009650 | .000650 | ..... | ..... | |
| 19,710 | 98,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 98,550 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2150 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ″.9 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.14, ″.29 |

## AXLE, 6-POUNDER GUN MOUNT, STEEL FORGING.

### No. 6175.

**Marks,** $\frac{A\text{-}1_1}{A\ 6.}$
**Diameter,** ″.505.
**Sectional area,** .20 square inch.
**Gauged length,** 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | |
| 7,600 | 38,000 | ..... | ..... | ..... | ..... | Elastic limit, approximate. |
| 7,800 | 39,000 | .010000 | .008800 | ..... | ..... | |
| 8,000 | 40,000 | .013600 | .003600 | ..... | ..... | |
| 8,200 | 41,000 | .013650 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .013700 | .000050 | ..... | ..... | |
| 8,600 | 43,000 | .013850 | .000150 | ..... | ..... | |
| 8,800 | 44,000 | .014150 | .000300 | ..... | ..... | |
| 9,000 | 45,000 | .014750 | .000600 | ..... | ..... | |
| 15,480 | 77,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,400 |
| Elastic limit per square inch of original section (approximate) | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .2750 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1″.25 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.29*, ″.26 |

# PIVOT SOCKETS—15-POUNDER GUN MOUNTS.

## STEEL CASTINGS.

## No. 6172.

Marks, $\frac{A-1}{PS\ 15}$.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000150 | 0. | ..... | |
| 4,000 | 20,000 | .000550 | .000150 | ..... | ..... | |
| 4,200 | 21,000 | .000650 | .000100 | ..... | ..... | |
| 4,400 | 22,000 | .000700 | .000050 | ..... | ..... | |
| 4,600 | 23,000 | .000800 | .000100 | ..... | ..... | |
| 4,800 | 24,000 | .000950 | .000150 | ..... | ..... | Elastic limit. |
| 5,000 | 25,000 | .001200 | .000250 | ..... | ..... | |
| 5,200 | 26,000 | .002000 | .000800 | ..... | ..... | |
| 5,400 | 27,000 | .004500 | .002500 | ..... | ..... | |
| 5,600 | 28,000 | .005700 | .001200 | ..... | ..... | |
| 5,800 | 29,000 | .007000 | .001300 | ..... | ..... | |
| 6,000 | 30,000 | .008000 | .001000 | ..... | ..... | |
| 6,200 | 31,000 | .009850 | .001850 | ..... | ..... | |
| 11,680 | 58,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 58,400 |
| Elastic limit per square inch of original section | do... | 24,000 |
| Elongation per inch after rupture | inch.. | .1400 |
| Elongation per inch under strain at elastic limit | do... | .000950 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | granular, 60 per cent; dull silky, 40 per cent |
| Elongation of inch sections | | ".12, ".16* |

## No. 6174.

Marks, $\frac{A\text{-}2}{PS\,15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | ..... | ..... | |
| 2,000 | 10,000 | .000650 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000600 | .000250 | .000100 | .000100 | |
| 3,200 | 16,000 | .000750 | .000150 | ..... | ..... | |
| 3,400 | 17,000 | .000950 | .000200 | ..... | ..... | |
| 3,600 | 18,000 | .001100 | .000150 | ..... | ..... | Elastic limit. |
| 3,800 | 19,000 | .001500 | .000400 | ..... | ..... | |
| 4,000 | 20,000 | .002350 | .000850 | ..... | ..... | |
| 4,200 | 21,000 | .003000 | .000650 | ..... | ..... | |
| 4,400 | 22,000 | .004000 | .001000 | ..... | ..... | |
| 4,600 | 23,000 | .005400 | .001400 | ..... | ..... | |
| 4,800 | 24,000 | .007000 | .001600 | ..... | ..... | |
| 5,000 | 25,000 | .008500 | .001500 | ..... | ..... | |
| 6,640 | 33,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 33,200 |
| Elastic limit per square inch of original section | do... | 18,000 |
| Elongation per inch after rupture | inch.. | .0650 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".72 from neck |
| Character of broken surface | | discolored, spongy |
| Elongation of inch sections | | ".10, ".03 |

## No. 6195.

**Marks,** $\frac{A-2}{P\ 8\ 15}$
**Diameter,** ″.505.
**Sectional area,** .20 square inch.
**Gauged length,** 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 4,600 | 23,000 | ..... | ..... | ..... | ..... | Elastic limit, approximate. |
| 6,000 | 30,000 | .014000 | .013350 | .012900 | .012900 | |
| 6,200 | 31,000 | .016050 | .002050 | ..... | ..... | |
| 6,400 | 32,000 | .017250 | .001200 | ..... | ..... | |
| 6,600 | 33,000 | .019500 | .002250 | ..... | ..... | |
| 6,800 | 34,000 | .021000 | .001500 | ..... | ..... | |
| 7,000 | 35,000 | .023750 | .002750 | ..... | ..... | |
| 10,820 | 54,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| **Tensile strength** per square inch of original section | pounds.. | 54,100 |
| **Elastic limit** per square inch of original section (approximate) | do... | 23,000 |
| **Elongation** per inch after rupture | inch.. | .1150 |
| **Reduction in diameter at point of rupture** | do... | .045 |
| **Reduction in area after rupture,** per cent of original section | | 16.9 |
| **Position of rupture** | | ″.6 from neck |
| **Character of broken surface** | | coarse granular, 70 per cent; dull, silky, 30 per cent |
| **Elongation of inch sections** | | ″.14*, ″.09 |

## No. 6201.

Marks, $\frac{A-5}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 4,400 | 22,000 | .000750 | .000100 | ..... | ..... | |
| 4,600 | 23,000 | .000800 | .000050 | ..... | ..... | |
| 4,800 | 24,000 | .000850 | .000050 | ..... | ..... | Elastic limit. |
| 5,000 | 25,000 | .001300 | .000450 | ..... | ..... | |
| 5,200 | 26,000 | .003550 | .002250 | ..... | ..... | |
| 5,400 | 27,000 | .005000 | .001450 | ..... | ..... | |
| 5,600 | 28,000 | .006000 | .001000 | ..... | ..... | |
| 5,800 | 29,000 | .007350 | .001350 | ..... | ..... | |
| 6,000 | 30,000 | .008800 | .001450 | ..... | ..... | |
| 11,670 | 58,350 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 58,350 |
| Elastic limit per square inch of original section | do... | 24,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | dull gray, amorphous |
| Elongation of inch sections | | ".17, ".23* |

## No. 6280.

Marks, $\frac{A\ 11}{P\ S\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000750 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000200 | .0 | ..... | |
| 7,000 | 35,000 | .001150 | .000200 | ..... | ..... | |
| 7,600 | 38,000 | .001300 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .001350 | .000050 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .002000 | .000050 | ..... | ..... | |
| | | .011000 | .009000 | ..... | ..... | |
| 8,200 | 41,000 | .012050 | .001050 | ..... | ..... | |
| 8,400 | 42,000 | .012950 | .000900 | ..... | ..... | |
| 8,600 | 43,000 | .014000 | .001050 | ..... | ..... | |
| 8,800 | 44,000 | .015000 | .001000 | ..... | ..... | |
| 9,000 | 45,000 | .016150 | .001150 | ..... | ..... | |
| 15,010 | 75,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 75,050 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1750 |
| Elongation per inch under strain at elastic limit | do... | .001350 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ″.9 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ″.19, ″.16 |

## No. 6281.

Marks, $\frac{A\ 12}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000750 | .000100 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000200 | 0. | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | ..... | ..... | |
| 7,600 | 38,000 | .001200 | .000100 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .011000 | .009800 | ..... | ..... | |
| 8,000 | 40,000 | .012400 | .001400 | ..... | ..... | |
| 8,200 | 41,000 | .013000 | .000600 | ..... | ..... | |
| 8,400 | 42,000 | .014100 | .001100 | ..... | ..... | |
| 8,600 | 43,000 | .015250 | .001150 | ..... | ..... | |
| 8,800 | 44,000 | .016400 | .001150 | ..... | ..... | |
| 9,000 | 45,000 | .017500 | .001100 | ..... | ..... | |
| 14,890 | 74,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 74,450 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .2050 |
| Elongation per inch under strain at elastic limit | do... | .001200 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".5 from neck |
| Character of broken surface | | dull, amorphous |
| Elongation of inch sections | | ".16, ".25 |

## No. 6282.

Marks $\frac{A\ 13}{PS\ 15}$
Diameter ″.505.
Sectional area .20 square inch.
Gauged length 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000750 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000250 | 0. | ..... | |
| 6,800 | 34,000 | .001200 | .000200 | ..... | ..... | Elastic limit. |
| 7,000 | 35,000 | .010500 | .000800 | ..... | ..... | |
| 7,200 | 36,000 | .011000 | .000500 | ..... | ..... | |
| 7,400 | 37,000 | .012000 | .001000 | ..... | ..... | |
| 7,600 | 38,000 | .013050 | .001050 | ..... | ..... | |
| 7,800 | 39,000 | .014050 | .001000 | ..... | ..... | |
| 8,000 | 40,000 | .015600 | .001550 | ..... | ..... | |
| 13,100 | 65,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,500 |
| Elastic limit per square inch of original section | do... | 34,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .001200 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ″.45 from neck |
| Character of broken surface | | granular 70 per cent, dull flaky 30 per cent |
| Elongation of inch sections | | ″.10⁸, ″.07 |

## No. 6429.

Marks, $\frac{A\ 13}{2\ P\ 8\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000250 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000100 | ..... | ..... | |
| 5,400 | 27,000 | .001000 | 0. | ..... | ..... | |
| 5,600 | 28,000 | .001100 | .000100 | ..... | ..... | |
| 5,800 | 29,000 | .001250 | .000150 | ..... | ..... | Elastic limit. |
| 6,000 | 30,000 | .002200 | .000950 | ..... | ..... | |
| 6,200 | 31,000 | .004050 | .001850 | ..... | ..... | |
| 6,400 | 32,000 | .007750 | .003700 | ..... | ..... | |
| 6,600 | 33,000 | .008250 | .000500 | ..... | ..... | |
| 6,800 | 34,000 | .009250 | .001000 | ..... | ..... | |
| 7,000 | 35,000 | .010200 | .000950 | ..... | ..... | |
| 7,200 | 36,000 | .011250 | .001050 | ..... | ..... | |
| 7,400 | 37,000 | .012500 | .001250 | ..... | ..... | |
| 12,080 | 60,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 60,400 |
| Elastic limit per square inch of original section | do... | 29,000 |
| E ongation per inch after rupture | inch.. | .1250 |
| Elongation per inch under strain at elastic limit | do... | .001250 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | granular 50 per cent, silky 50 per cent |
| Elongation of inch sections | | ".08, ".17* |

## No. 6283.

Marks, $\frac{A-14}{P\ S-15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000350 | .000100 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000200 | ..... | ..... | |
| 5,000 | 25,000 | .000650 | .000100 | ..... | ..... | |
| 6,000 | 30,000 | .000850 | .000200 | 0. | ..... | |
| 6,800 | 34,000 | .001100 | .000250 | ..... | ..... | Elastic limit. |
| 7,000 | 35,000 | .010500 | .009400 | ..... | ..... | |
| 7,200 | 36,000 | .011250 | .000750 | ..... | ..... | |
| 7,400 | 37,000 | .013000 | .001750 | ..... | ..... | |
| 7,600 | 38,000 | .013250 | .000250 | ..... | ..... | |
| 7,800 | 39,000 | .014050 | .000800 | ..... | ..... | |
| 8,000 | 40,000 | .015000 | .000950 | ..... | ..... | |
| 14,210 | 71,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 71,050 |
| Elastic limit per square inch of original section | do... | 34,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".25, ".17 |

## No. 6284.

Marks, $\frac{A-15}{P\ S\ 15}$
Diameter, ".496.
Sectional area, .1932 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 193 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 966 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,932 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 2,898 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 3,864 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 4,830 | 25,000 | .000850 | .000200 | ..... | ..... | |
| 5,796 | 30,000 | .001000 | .000150 | 0. | ..... | |
| 6,762 | 35,000 | .001150 | .000150 | ..... | ..... | Elastic limit. |
| | | .009500 | .008350 | ..... | ..... | |
| 6,955 | 36,000 | .010000 | .000500 | ..... | ..... | |
| 7,148 | 37,000 | .010500 | .000500 | ..... | ..... | |
| 7,342 | 38,000 | .012000 | .001500 | ..... | ..... | |
| 7,535 | 39,000 | .013450 | .001450 | ..... | ..... | |
| 7,728 | 40,000 | .015000 | .001550 | ..... | ..... | |
| 13,910 | 72,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 72,000 |
| Elastic limit per square inch of original section | do... | 35,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .076 |
| Reduction in area after rupture, per cent of original section | | 28.3 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".26[2], ".19 |

## No. 6341.

**Marks,** $\frac{A\ 16}{PS\ 15}$.
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .000800 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000250 | ..... | ..... | |
| 6,800 | 34,000 | .001250 | .000200 | ..... | ..... | Elastic limit. |
| 7,000 | 35,000 | .002000 | .000750 | ..... | ..... | |
| 7,200 | 36,000 | .008600 | .006600 | ..... | ..... | |
| 7,400 | 37,000 | .009900 | .001300 | ..... | ..... | |
| 7,600 | 38,000 | .010550 | .000650 | ..... | ..... | |
| 7,800 | 39,000 | .011750 | .001200 | ..... | ..... | |
| 8,000 | 40,000 | .013250 | .001500 | ..... | ..... | |
| 14,420 | 72,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| **Tensile strength** per square inch of original section | pounds.. | 72,100 |
| **Elastic limit** per square inch of original section | do... | 34,000 |
| **Elongation** per inch after rupture | inch.. | .2350 |
| **Elongation** per inch under strain at elastic limit | do... | .001250 |
| **Reduction** in diameter at point of rupture | do... | .105 |
| **Reduction** in area after rupture, per cent of original section | | 87.1 |
| **Position of rupture** | | 1".13 from neck |
| **Character of broken surface** | | dull silky |
| **Elongation** of inch sections | | ".28*, ".19 |

## No. 6432.

Marks, $\frac{A\ 17}{P\ S\ 15}$
Diameter, .″501.
Sectional area, .197 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 197 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 985 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,970 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 2,955 | 15,000 | .000400 | .000200 | ..... | ..... | |
| 3,940 | 20,000 | .000550 | .000150 | ..... | ..... | |
| 4,925 | 25,000 | .000750 | .000200 | ..... | ..... | |
| 5,910 | 30,000 | .001000 | .000250 | ..... | ..... | |
| 6,107 | 31,000 | .001050 | .000050 | ..... | ..... | Elastic limit. |
| 6,304 | 32,000 | .007000 | .005950 | ..... | ..... | |
| 6,501 | 33,000 | .008150 | .001150 | ..... | ..... | |
| 6,698 | 34,000 | .009500 | .001350 | ..... | ..... | |
| 6,895 | 35,000 | .011000 | .001500 | ..... | ..... | |
| 7,092 | 36,000 | .011900 | .000900 | ..... | ..... | |
| 7,289 | 37,000 | .012500 | .000600 | ..... | ..... | |
| 7,486 | 38,000 | .013500 | .001000 | ..... | ..... | |
| 7,683 | 39,000 | .014850 | .001350 | ..... | ..... | |
| 7,880 | 40,000 | .016500 | .001650 | ..... | ..... | |
| 13,890 | 70,510 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 70,510 |
| Elastic limit per square inch of original section | do... | 31,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .081 |
| Reduction in area after rupture, per cent of original section | | 29.7 |
| Position of ruputre | | at middle of stem |
| Character of broken surface | | dull silky 70 per cent, granular 30 per cent |
| Elongation of inch sections | | ″.24*, ″.24* |

## No. 6343.

Marks, $\frac{A\ 18}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000200 | ..... | ..... | |
| 5,000 | 25,000 | .000800 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000200 | ..... | ..... | |
| 6,600 | 33,000 | .001150 | .000150 | ..... | ..... | Elastic limit. |
| 6,800 | 34,000 | .001300 | .000150 | ..... | ..... | |
| 7,000 | 35,000 | .010500 | .009200 | ..... | ..... | |
| 7,200 | 36,000 | .011450 | .000950 | ..... | ..... | |
| 7,400 | 37,000 | .012500 | .001050 | ..... | ..... | |
| 7,600 | 38,000 | .013600 | .001100 | ..... | ..... | |
| 7,800 | 39,000 | .014650 | .001050 | ..... | ..... | |
| 8,000 | 40,000 | .016750 | .002100 | ..... | ..... | |
| 13,810 | 69,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 69,050 |
| Elastic limit per square inch of original section | do.... | 33,000 |
| Elongation per inch after rupture | inch.. | .2800 |
| Elongation per inch under strain at elastic limit | do.... | .001150 |
| Reduction in diameter at point of rupture | do.... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | dull silky, serrated |
| Elongation of inch sections | | ".25*, ".28* |

## No. 6344.

Marks, $\frac{A\ 19}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000950 | .000300 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000050 | ..... | ..... | |
| 5,400 | 27,000 | .001100 | .000100 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .001300 | .000200 | ..... | ..... | |
| 5,800 | 29,000 | .001800 | .000500 | ..... | ..... | |
| 6,000 | 30,000 | .002500 | .000700 | ..... | ..... | |
| 6,200 | 31,000 | .004750 | .002250 | ..... | ..... | |
| 6,400 | 32,000 | .006050 | .001300 | ..... | ..... | |
| 6,600 | 33,000 | .007100 | .001050 | ..... | ..... | |
| 6,800 | 34,000 | .008600 | .001500 | ..... | ..... | |
| 7,000 | 35,000 | .009500 | .000900 | ..... | ..... | |
| 13,300 | 66,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 66,500 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .2700 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | ".65 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".22, ".32 |

## No. 6345.

Marks, $\frac{A\ 20}{P\ S\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000200 | ..... | ..... | |
| 4,400 | 22,000 | .000700 | .000100 | ..... | ..... | |
| 4,600 | 23,000 | .000750 | .000050 | ..... | ..... | |
| 4,800 | 24,000 | .000800 | .000050 | ..... | ..... | Elastic limit. |
| 5,000 | 25,000 | .001150 | .000350 | ..... | ..... | |
| 5,200 | 26,000 | .001800 | .000650 | ..... | ..... | |
| 5,400 | 27,000 | .002400 | .000600 | ..... | ..... | |
| 5,600 | 28,000 | .003050 | .000650 | ..... | ..... | |
| 5,800 | 29,000 | .003950 | .000900 | ..... | ..... | |
| 6,000 | 30,000 | .005000 | .001050 | ..... | ..... | |
| 6,200 | 31,000 | .006700 | .000700 | ..... | ..... | |
| 6,400 | 32,000 | .007050 | .001350 | ..... | ..... | |
| 6,600 | 33,000 | .008000 | .000950 | ..... | ..... | |
| 6,800 | 34,000 | .009050 | .001050 | ..... | ..... | |
| 7,000 | 35,000 | .010000 | .000950 | ..... | ..... | |
| 12,880 | 64,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 64,400 |
| Elastic limit per square inch of original section | do... | 24,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .000800 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | 1″.1 from neck |
| Character of broken surface | | dull amorphous, 70 per cent; granular, 30 per cent |
| Elongation of inch sections | | ″.21, ″.25 |

## No. 6346.

Marks, $\frac{A\ 21}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000750 | .000150 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000250 | ..... | ..... | Elastic limit. |
| 5,400 | 27,000 | .001350 | .000350 | ..... | ..... | |
| 5,600 | 28,000 | .002050 | .000700 | ..... | ..... | |
| 5,800 | 29,000 | .002850 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .004100 | .001250 | ..... | ..... | |
| 6,200 | 31,000 | .004900 | .000800 | ..... | ..... | |
| 6,400 | 32,000 | .006000 | .001100 | ..... | ..... | |
| 6,600 | 33,000 | .007000 | .001000 | ..... | ..... | |
| 6,800 | 34,000 | .008150 | .001150 | ..... | ..... | |
| 7,000 | 35,000 | .009500 | .001350 | ..... | ..... | |
| 13,320 | 66,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength, per square inch of original section | pounds... | 66,600 |
| Elastic limit per square inch of original section | do... | 26,000 |
| Elongation per inch after rupture | inch.. | ".2750 |
| Elongation per inch under strain at elastic limit | do... | ".001000 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | dull, silky, oblique |
| Elongation of inch sections | | ".21, ".34 |

## No. 6347.

Marks, $\frac{A\ 22}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000200 | ..... | ..... | |
| 4,800 | 24,000 | .000750 | .000150 | ..... | ..... | Elastic limit, not well defined. |
| 5,000 | 25,000 | .000900 | .000150 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000100 | ..... | ..... | |
| 5,400 | 27,000 | .001100 | .000100 | ..... | ..... | |
| 5,600 | 28,000 | .001200 | .000100 | ..... | ..... | |
| 5,800 | 29,000 | .001450 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001850 | .000400 | ..... | ..... | |
| 6,200 | 31,000 | .002500 | .000650 | ..... | ..... | |
| 6,400 | 32,000 | .003600 | .001100 | ..... | ..... | |
| 6,600 | 33,000 | .004550 | .000950 | ..... | ..... | |
| 6,800 | 34,000 | .005650 | .001100 | ..... | ..... | |
| 7,000 | 35,000 | .006550 | .000900 | ..... | ..... | |
| 13,770 | 68,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 68,850 |
| Elastic limit per square inch of original section, not well defined | do... | 24,000 |
| Elongation per inch after rupture | inch.. | .2600 |
| Elongation per inch under strain at elastic limit | do... | .000750 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".34", ".18 |

## No. 6359.

Marks, $\frac{A\ 23}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5.000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 3,600 | 18,000 | .000550 | .000100 | ..... | ..... | |
| 3,800 | 19,000 | .000650 | .000100 | ..... | ..... | Elastic limit. |
| 4,000 | 20,000 | .000850 | .000200 | ..... | ..... | |
| 4,200 | 21,000 | .001900 | .000050 | ..... | ..... | |
| 4,400 | 22,000 | .002600 | .000700 | ..... | ..... | |
| 4,600 | 23,000 | .003750 | .001150 | ..... | ..... | |
| 4,800 | 24,000 | .004650 | .000900 | ..... | ..... | |
| 5,000 | 25,000 | .005900 | .001250 | ..... | ..... | |
| 5,200 | 26,000 | .007000 | .001100 | ..... | ..... | |
| 5,400 | 27,000 | .008400 | .001400 | ..... | ..... | |
| 5,600 | 28,000 | .009550 | .001150 | ..... | ..... | |
| 5,800 | 29,000 | .011500 | .001950 | ..... | ..... | |
| 6,000 | 30,000 | .012650 | .001150 | ..... | ..... | |
| 11,610 | 58,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 58,050 |
| Elastic limit per square inch of original section | do... | 19,000 |
| Elongation per inch after rupture | inch.. | .3250 |
| Elongation per inch under strain at elastic limit | do... | .003650 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".28, ".370 |

## No. 6430.

Marks, $\frac{A\ 23}{2\ P.S.\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000300 | ..... | ..... | |
| 3,200 | 16,000 | .000550 | .000050 | ..... | ..... | |
| 3,400 | 17,000 | .000650 | .000100 | ..... | ..... | |
| 3,600 | 18,000 | .000800 | .000150 | ..... | ..... | Elastic limit. |
| 3,800 | 19,000 | .001500 | .000700 | ..... | ..... | |
| 4,000 | 20,000 | .001700 | .000200 | ..... | ..... | |
| 4,200 | 21,000 | .002150 | .000450 | ..... | ..... | |
| 4,400 | 22,000 | .003000 | .000850 | ..... | ..... | |
| 4,600 | 23,000 | .003950 | .000950 | ..... | ..... | |
| 4,800 | 24,000 | .005000 | .001050 | ..... | ..... | |
| 5,000 | 25,000 | .006250 | .001250 | ..... | ..... | |
| 5,200 | 26,000 | .007150 | .000900 | ..... | ..... | |
| 5,400 | 27,000 | .008500 | .001350 | ..... | ..... | |
| 5,600 | 28,000 | .010000 | .001500 | ..... | ..... | |
| 5,800 | 29,000 | .011250 | .001250 | ..... | ..... | |
| 10,850 | 54,250 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of orginal section | pounds.. | 54,250 |
| Elastic limit per square inch of original section | do... | 18,000 |
| Elongation per inch after rupture | inch.. | .1350 |
| Elongation per inch under strain at elastic limit | do... | .000800 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".50 from neck |
| Character of broken surface | | granular, spongy spot at the circumference |
| Elongation of inch sections | | ".17⁸,".10 |

## No. 6360.

Marks, $\frac{A\ 24}{P\ S\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000100 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000250 | ..... | ..... | |
| 5,200 | 26,000 | .000900 | .000050 | ..... | ..... | |
| 5,400 | 27,000 | .001000 | .000100 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .001300 | .000300 | ..... | ..... | |
| 5,800 | 29,000 | .001500 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001800 | .000300 | ..... | ..... | |
| 6,200 | 31,000 | .002050 | .000250 | ..... | ..... | |
| 6,400 | 32,000 | .002850 | .000800 | ..... | ..... | |
| 6,600 | 33,000 | .003300 | .000450 | ..... | ..... | |
| 6,800 | 34,000 | .004050 | .000750 | ..... | ..... | |
| 7,000 | 35,000 | .005000 | .000950 | ..... | ..... | |
| 14,600 | 73,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 73,000 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | ″.95 from neck |
| Character of broken surface | | dull, amorphous, oblique |
| Elongation of inch sections | | ″.19, ″.29* |

## No. 6361.

Marks, $\frac{A\ 25}{P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000200 | ..... | ..... | |
| 4,200 | 21,000 | .000700 | .000050 | ..... | ..... | |
| 4,400 | 22,000 | .000800 | .000100 | ..... | ..... | Elastic limit, not well defined. |
| 4,600 | 23,000 | .001000 | .000200 | ..... | ..... | |
| 4,800 | 24,000 | .001100 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .001200 | .000100 | ..... | ..... | |
| 5,200 | 26,000 | .001500 | .000300 | ..... | ..... | |
| 5,400 | 27,000 | .001850 | .000350 | ..... | ..... | |
| 5,600 | 28,000 | .002400 | .000550 | ..... | ..... | |
| 5,800 | 29,000 | .003050 | .000650 | ..... | ..... | |
| 6,000 | 30,000 | .003900 | .000850 | ..... | ..... | |
| 13,110 | 65,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,550 |
| Elastic limit per square inch of original section, not well defined | do... | 22,000 |
| Elongation per inch after rupture | inch.. | .1300 |
| Elongation per inch under strain at elastic limit | do... | .000800 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".45 from neck |
| Character of broken surface | | granular, 55 per cent; silky center, 45 per cent |
| Elongation of inch sections | | ".11, ".15* |

## No. 6433.

Marks, $\frac{A\ 25}{2\ P\ S\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000850 | .000350 | ..... | ..... | |
| 4,200 | 21,000 | .000950 | .000100 | ..... | ..... | |
| 4,400 | 22,000 | .001050 | .000100 | ..... | ..... | |
| 4,600 | 23,000 | .001150 | .000100 | ..... | ..... | Elastic limit. |
| 4,800 | 24,000 | .001650 | .000500 | ..... | ..... | |
| 5,000 | 25,000 | .002000 | .000350 | ..... | ..... | |
| 5,200 | 26,000 | .002950 | .000950 | ..... | ..... | |
| 5,400 | 27,000 | .003250 | .000300 | ..... | ..... | |
| 5,600 | 28,000 | .004000 | .000750 | ..... | ..... | |
| 5,800 | 29,000 | .005000 | .001000 | ..... | ..... | |
| 6,000 | 30,000 | .006000 | .001000 | ..... | ..... | |
| 6,200 | 31,000 | .006950 | .000950 | ..... | ..... | |
| 6,400 | 32,000 | .007850 | .000900 | ..... | ..... | |
| 6,600 | 33,000 | .009000 | .001150 | ..... | ..... | |
| 11,380 | 56,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,900 |
| Elastic limit per square inch of original section | do... | 23,000 |
| Elongation per inch after rupture | inch.. | .0600 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | at the neck |
| Character of broken surface | | granular, spongy spot at circumference |
| Elongation of inch sections | | ".06, ".06 |

## No. 6362.

Marks, $\frac{A\ 26}{P\ S\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000050 | ..... | ..... | |
| 5,600 | 28,000 | .001050 | .000150 | ..... | ..... | Elastic limit. |
| 5,800 | 29,000 | .001200 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001500 | .000800 | ..... | ..... | |
| 6,200 | 31,000 | .001750 | .000250 | ..... | ..... | |
| 6,400 | 32,000 | .002050 | .000800 | ..... | ..... | |
| 6,600 | 33,000 | .002500 | .000450 | ..... | ..... | |
| 6,800 | 34,000 | .003350 | .000850 | ..... | ..... | |
| 7,000 | 35,000 | .004000 | .000650 | ..... | ..... | |
| 13,190 | 65,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,950 |
| Elastic limit per square inch of original section | do... | 28,000 |
| Elongation per inch after rupture | inch.... | .0650 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | do... | 5.7 |
| Position of rupture | | ″.2 from neck |
| Character of broken surface | | medium coarse, granular |
| Elongation of inch sections | | ″.05*, ″.06 |

## No. 6434.

Marks, $\frac{A\ 26}{2\ P\ S\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .001000 | .000350 | ..... | ..... | |
| 5,200 | 26,000 | .001050 | .000050 | ..... | ..... | |
| 5,400 | 27,000 | .001200 | .000150 | ..... | ..... | |
| 5,600 | 28,000 | .001400 | .000200 | ..... | ..... | Elastic limit. |
| 5,800 | 29,000 | .002000 | .000600 | ..... | ..... | |
| 6,000 | 30,000 | .002350 | .000350 | ..... | ..... | |
| 6,200 | 31,000 | .003000 | .000650 | ..... | ..... | |
| 6,400 | 32,000 | .003650 | .000650 | ..... | ..... | |
| 6,600 | 33,000 | .004550 | .000900 | ..... | ..... | |
| 6,800 | 34,000 | .005200 | .000650 | ..... | ..... | |
| 7,000 | 35,000 | .006000 | .000900 | ..... | ..... | |
| 7,200 | 36,000 | .007000 | .001000 | ..... | ..... | |
| 7,400 | 37,000 | .007700 | .000700 | ..... | ..... | |
| 7,600 | 38,000 | .008550 | .000850 | ..... | ..... | |
| 7,800 | 39,000 | .009500 | .000950 | ..... | ..... | |
| 8,000 | 40,000 | .010600 | .001100 | ..... | ..... | |
| 13,480 | 67,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 67,400 |
| Elastic limit per square inch of original section | do... | 28,000 |
| Elongation per inch after rupture | inch.. | .0800 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | 1″ from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ″.10⁸, ″.06 |

## No. 6388.

**Marks,** $\frac{A\ 27}{P\ S\ 15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000200 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000200 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000100 | ..... | ..... | |
| 5,400 | 27,000 | .001100 | .000100 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .001800 | .000700 | ..... | ..... | |
| 5,800 | 29,000 | .001950 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .002250 | .000300 | ..... | ..... | |
| 6,200 | 31,000 | .003550 | .001300 | ..... | ..... | |
| 6,400 | 32,000 | .004500 | .000950 | ..... | ..... | |
| 6,600 | 33,000 | .005550 | .001050 | ..... | ..... | |
| 6,800 | 34,000 | .006100 | .000550 | ..... | ..... | |
| 7,000 | 35,000 | .007300 | .001200 | ..... | ..... | |
| 7,200 | 36,000 | .008100 | .000800 | ..... | ..... | |
| 7,400 | 37,000 | .009050 | .000950 | ..... | ..... | |
| 7,600 | 38,000 | .010500 | .001450 | ..... | ..... | |
| 7,800 | 39,000 | .012150 | .001650 | ..... | ..... | |
| 8,000 | 40,000 | .013000 | .000850 | ..... | ..... | |
| 13,020 | 65,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,100 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch... | .1000 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".5 from neck |
| Character of broken surface | | granular, 85 per cent; dull silky, 15 per cent |
| Elongation of inch sections | | ",11*, ".09 |

## No. 6425.

Marks, $\frac{A\ 27}{2\ PS.\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000150 | ..... | ..... | |
| 6,600 | 33,000 | .001150 | .000100 | ..... | ..... | Elastic limit. |
| 6,800 | 34,000 | .001300 | .000150 | ..... | ..... | |
| | | .009000 | .007700 | ..... | ..... | |
| 7,000 | 35,000 | .010300 | .001300 | ..... | ..... | |
| 7,200 | 36,000 | .011000 | .000700 | ..... | ..... | |
| 7,400 | 37,000 | .012100 | .001100 | ..... | ..... | |
| 7,600 | 38,000 | .013150 | .001050 | ..... | ..... | |
| 7,800 | 39,000 | .014500 | .001350 | ..... | ..... | |
| 8,000 | 40,000 | .016250 | .001750 | ..... | ..... | |
| 13,100 | 65,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,500 |
| Elastic limit per square inch of original section | do... | 33,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.60 from neck |
| Character of broken surface | | granular 85 per cent, dull silky 15 per cent |
| Elongation of inch sections | | ″.12*, ″.10 |

## No. 6389.

**Marks,** $\frac{A\ 28}{P.S.15}$
**Diameter,** ″.505.
**Sectional area,** .20 square inch.
**Gauged length,** 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .001050 | .000400 | ..... | ..... | |
| 5,200 | 26,000 | .001150 | .000100 | ..... | ..... | |
| 5,400 | 27,000 | .001250 | .000100 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .001550 | .000300 | ..... | ..... | |
| 5,800 | 29,000 | .002000 | .000450 | ..... | ..... | |
| 6,000 | 30,000 | .002450 | .000450 | ..... | ..... | |
| 6,200 | 31,000 | .003000 | .000550 | ..... | ..... | |
| 6,400 | 32,000 | .004000 | .001000 | ..... | ..... | |
| 6,600 | 33,000 | .004850 | .000850 | ..... | ..... | |
| 6,800 | 34,000 | .005900 | .001050 | ..... | ..... | |
| 7,000 | 35,000 | .007100 | .001200 | ..... | ..... | |
| 7,200 | 36,000 | .008000 | .000900 | ..... | ..... | |
| 7,400 | 37,000 | .009000 | .001000 | ..... | ..... | |
| 7,600 | 38,000 | .010200 | .001200 | ..... | ..... | |
| 7,800 | 39,000 | .011500 | .001300 | ..... | ..... | |
| 8,000 | 40,000 | .012750 | .001250 | ..... | ..... | |
| 13,090 | 65,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,450 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001250 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.7 from neck |
| Character of broken surface | | granular, with silky metal intermingled |
| Elongation of inch sections | | ″.09, ″.13* |

## No. 6426.

Marks, $\frac{A\ 28}{2\ P\ S\ 15}$
Diameter, ″.505
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000250 | ..... | ..... | |
| 5,000 | 25,000 | .000700 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000800 | ..... | ..... | |
| 6,200 | 31,000 | .001050 | .000050 | ..... | ..... | |
| 6,400 | 32,000 | .001100 | .000050 | ..... | ..... | Elastic limit. |
| 6,600 | 33,000 | .007500 | .006400 | ..... | ..... | |
| 6,800 | 34,000 | .008900 | .001400 | ..... | ..... | |
| 7,000 | 35,000 | .010500 | .001600 | ..... | ..... | |
| 13,690 | 68,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 68,450 |
| Elastic limit per square inch of original section | do... | 32,000 |
| Elongation per inch after rupture | inch.. | .1450 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.05 from neck |
| Character of broken surface | | granular, flaky spot at the circumference |
| Elongation of inch sections | | ″.14, ″.15* |

## No. 6427.

Marks, $\frac{A\ 29}{P.\ S.\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000250 | ..... | ..... | |
| 5,000 | 28,000 | .001050 | .000150 | ..... | ..... | Elastic limit. |
| 5,800 | 29,000 | .004550 | .003500 | ..... | ..... | |
| 6,000 | 30,000 | .006500 | .001950 | ..... | ..... | |
| 6,200 | 31,000 | .007500 | .001000 | ..... | ..... | |
| 6,400 | 32,000 | .008250 | .000750 | ..... | ..... | |
| 6,600 | 33,000 | .009500 | .001250 | ..... | ..... | |
| 6,800 | 34,000 | .010250 | .000750 | ..... | ..... | |
| 7,000 | 35,000 | .011500 | .001250 | ..... | ..... | |
| 13,760 | 68,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 68,800 |
| Elastic limit per square inch of original section | do... | 28,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ″.65 from neck |
| Character of broken surface | | granular, silky spot at the circumference |
| Elongation of inch sections | | ″.24⁸, ″.16 |

## No. 6428.

Marks, $\frac{A\ 80}{P.\ S.\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,600 | 18,000 | .000600 | .000250 | ..... | ..... | |
| 3,800 | 19,000 | .000700 | .000100 | ..... | ..... | Elastic limit. |
| 4,000 | 20,000 | .001600 | .000900 | ..... | ..... | |
| 4,200 | 21,000 | .002400 | .000800 | ..... | ..... | |
| 4,400 | 22,000 | .003300 | .000900 | ..... | ..... | |
| 4,600 | 23,000 | .004500 | .001200 | ..... | ..... | |
| 4,800 | 24,000 | .006050 | .001550 | ..... | ..... | |
| 5,000 | 25,000 | .007750 | .001700 | ..... | ..... | |
| 5,200 | 26,000 | .009500 | .001750 | ..... | ..... | |
| 5,400 | 27,000 | .012000 | .002500 | ..... | ..... | |
| 5,600 | 28,000 | .015500 | .003500 | ..... | ..... | |
| 5,740 | 28,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 28,700 |
| Elastic limit per square inch of original section | do... | 19,000 |
| Elongation per inch after rupture | inch.. | .0350 |
| Elongation per inch under strain at elastic limit | do... | .000700 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | dull amorphous, granular and spongy parts. Fractured in two places. |
| Elongation of inch sections | | ".06*, ".01 |

## No. 6436.

**Marks,** $\frac{A\ 31}{P.S.\ 15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000550 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000900 | .000850 | ..... | ..... | |
| 4,200 | 21,000 | .000950 | .000850 | ..... | ..... | |
| 4,400 | 22,000 | .001000 | .000850 | ..... | ..... | Elastic limit. |
| 4,600 | 23,000 | .001700 | .000700 | ..... | ..... | |
| 4,800 | 24,000 | .002000 | .000800 | ..... | ..... | |
| 5,000 | 25,000 | .002000 | .001000 | ..... | ..... | |
| 5,200 | 26,000 | .003550 | .000550 | ..... | ..... | |
| 5,400 | 27,000 | .004500 | .000950 | ..... | ..... | |
| 5,600 | 28,000 | .006000 | .001500 | ..... | ..... | |
| 5,800 | 29,000 | .008000 | .008000 | ..... | ..... | |
| 6,000 | 30,000 | .011750 | .002750 | ..... | ..... | |
| 6,200 | 31,000 | .016250 | .004500 | ..... | ..... | |
| 6,360 | 31,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

**Tensile strength** per square inch of original section ..... pounds.. 31,800
**Elastic limit** per square inch of original section ..... do... 22,000
**Elongation** per inch after rupture ..... inch.. .0200
**Elongation** per inch under strain at elastic limit ..... do... .001000
**Position of rupture** ..... in threaded end
**Character of broken surface** ..... fine granular 25 per cent, spongy 75 per cent. Opened crack in surface of stem.
**Elongation of inch sections** ..... ".02, ".02

## No. 6432.

Marks, $\frac{A\ 32}{P.\ S.\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | | |
| 2,000 | 10,000 | .000800 | .000150 | | | |
| 3,000 | 15,000 | .000500 | .000200 | | | |
| 4,000 | 20,000 | .000700 | .000200 | | | |
| 5,000 | 25,000 | .000850 | .000150 | | | |
| 6,000 | 30,000 | .001000 | .000150 | | | |
| 6,200 | 31,000 | .001000 | 0. | | | |
| 6,400 | 32,000 | .001050 | .000050 | | | |
| 6,600 | 33,000 | .001100 | .000050 | | | |
| 6,800 | 34,000 | .001150 | .000050 | | | Elastic limit. |
| 7,000 | 35,000 | .013200 | .002050 | | | |
| 7,200 | 36,000 | .013250 | .000050 | | | |
| 7,400 | 37,000 | .013500 | .000250 | | | |
| 7,600 | 38,000 | .014500 | .001000 | | | |
| 7,800 | 39,000 | .015500 | .001000 | | | |
| 8,000 | 40,000 | .017150 | .001650 | | | |
| 8,200 | 41,000 | .018100 | .000950 | | | |
| 8,400 | 42,000 | .019750 | .001650 | | | |
| 8,600 | 43,000 | .021050 | .001300 | | | |
| 8,800 | 44,000 | .022500 | .001450 | | | |
| 13,990 | 69,950 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 69,950 |
| Elastic limit per square inch of original section | do... | 34,000 |
| Elongation per inch after rupture | inch.. | 2,290 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 340 |
| Position of rupture | | ".40 from neck |
| Character of broken surface | | dull silky; traces of granulation |
| Elongation of inch sections | | ".16, ".29 |

# INNER BASES—15-POUNDER GUN MOUNTS.

## STEEL CASTINGS.

## No. 6199.

Marks, $\frac{A\text{-}1}{I\text{-}B\text{-}15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000200 | ..... | ..... | |
| 5,000 | 25,000 | .000800 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000250 | .000050 | .000050 | |
| 6,600 | 33,000 | .001200 | .000150 | ..... | ..... | Elastic limit. |
| 6,800 | 34,000 | .001450 | .000250 | ..... | ..... | |
| 7,000 | 35,000 | .002150 | .000700 | ..... | ..... | |
| 7,200 | 36,000 | .002800 | .000650 | ..... | ..... | |
| 7,400 | 37,000 | .003600 | .000800 | ..... | ..... | |
| 7,600 | 38,000 | .004500 | .000900 | ..... | ..... | |
| 7,800 | 39,000 | .005050 | .000550 | ..... | ..... | |
| 8,000 | 40,000 | .006000 | .000950 | ..... | ..... | |
| 16,380 | 81,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 81,900 |
| Elastic limit per square inch of original section | do... | 33,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001200 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.95 from neck |
| Character of broken surface | | granular, varying from coarse to fine |
| Elongation of inch sections | | ″.10, ″.12* |

## No. 6169.

Marks, $\frac{A\text{-}2}{I\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,000 | 5,000 | 0. | 0. | 0. | ..... | Initial load. |
| 2,000 | 10,000 | .000250 | .000250 | .000250 | .000250 | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .008000 | .007400 | .007900 | .007650 | |
| 6,200 | 31,000 | .009350 | .001350 | ..... | ..... | |
| 6,400 | 32,000 | .010300 | .000950 | ..... | ..... | |
| 6,600 | 33,000 | .012000 | .001700 | ..... | ..... | |
| 6,800 | 34,000 | .013150 | .001150 | ..... | ..... | |
| 7,000 | 35,000 | .014750 | .001600 | ..... | ..... | |
| 11,680 | 58,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds | 58,400 |
| Elastic limit per square inch of original section | pounds | below 30,000 |
| Elongation per inch after rupture | inch | .1500 |
| Reduction in diameter at point of rupture | do | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ″.85 from neck |
| Character of broken surface | | dull silky; trace of granulation |
| Elongation of inch sections | | ″.19[a], ″.11 |

## No. 6395.

Marks, $\frac{A\,2}{2\,I\,B\,15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 4,600 | 23,000 | .000800 | .000200 | ..... | ..... | |
| 4,800 | 24,000 | .000800 | .000050 | ..... | ..... | Elastic limit. |
| 5,000 | 25,000 | .003600 | .002750 | ..... | ..... | |
| 5,200 | 26,000 | .004500 | .000900 | ..... | ..... | |
| 5,400 | 27,000 | .005750 | .001250 | ..... | ..... | |
| 5,600 | 28,000 | .007000 | .001250 | ..... | ..... | |
| 5,800 | 29,000 | .008250 | .001250 | ..... | ..... | |
| 6,000 | 30,000 | .009400 | .001150 | ..... | ..... | |
| 6,400 | 32,000 | .011750 | .002350 | ..... | ..... | |
| 6,800 | 34,000 | .015000 | .003250 | ..... | ..... | |
| 7,200 | 36,000 | .018050 | .003050 | ..... | ..... | |
| 7,600 | 38,000 | .021500 | .003450 | ..... | ..... | |
| 8,000 | 40,000 | .025400 | .003900 | ..... | ..... | |
| 8,400 | 42,000 | .029500 | .004100 | ..... | ..... | |
| 8,800 | 44,000 | .035000 | .005500 | ..... | ..... | |
| 9,200 | 46,000 | .040000 | .005000 | ..... | ..... | |
| 9,600 | 48,000 | .046000 | .006000 | ..... | ..... | |
| 10,000 | 50,000 | .054000 | .008000 | ..... | ..... | |
| 10,400 | 52,000 | .063500 | .009500 | ..... | ..... | |
| 10,800 | 54,000 | .074000 | .010500 | ..... | ..... | |
| 11,510 | 57,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 57,550 |
| Elastic limit per square inch of original section | do... | 24,000 |
| Elongation per inch after rupture | inch.. | .1400 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | dull amorphous; opened cracks along surface of stem |
| Elongation of inch sections | | ".17", ".11 |

## No. 6270.

Marks, $\frac{A\ 5}{1\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000100 | 0. | ..... | |
| 5,000 | 25,000 | .000700 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000900 | .000050 | .000050 | Elastic limit. |
| 6,200 | 31,000 | .013000 | .012000 | ..... | ..... | |
| 6,400 | 32,000 | .013750 | .000750 | ..... | ..... | |
| 6,600 | 33,000 | .015000 | .001250 | ..... | ..... | |
| 6,800 | 34,000 | .016400 | .001400 | ..... | ..... | |
| 7,000 | 35,000 | .018000 | .001600 | ..... | ..... | |
| 12,200 | 61,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 61,000 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch.. | .1750 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ″.75 from neck |
| Character of broken surface | | dull gray, amorphous, spongy streak across center |
| Elongation of inch sections | | ″.15, ″.20 |

## No. 6200.

Marks, $\frac{A\ 6}{I\text{-}B\text{-}15}$
Diameter, ″.505
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | 0. | ..... | Elastic limit. |
| 6,200 | 31,000 | .009000 | .008050 | ..... | ..... | |
| 6,400 | 32,000 | .013500 | .004500 | ..... | ..... | |
| 6,600 | 33,000 | .014750 | .001250 | ..... | ..... | |
| 6,800 | 34,000 | .016000 | .001250 | ..... | ..... | |
| 7,000 | 35,000 | .018000 | .002000 | ..... | ..... | |
| 11,210 | 56,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,050 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .000950 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | 1″. from neck |
| Character of broken surface | | dull silky, oblique. Opened cracks in surface of stem |
| Elongation of inch sections | | ″.09, ″.15 |

## No. 6421.

Marks, $\frac{A\ 6}{2\ I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000700 | .000100 | ..... | ..... | |
| 5,400 | 27,000 | .000850 | .000150 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .004000 | .003150 | ..... | ..... | |
| 5,800 | 29,000 | .007000 | .003000 | ..... | ..... | |
| 6,000 | 30,000 | .009000 | .002000 | ..... | ..... | |
| 6,200 | 31,000 | .010250 | .001250 | ..... | ..... | |
| 6,400 | 32,000 | .012500 | .002250 | ..... | ..... | |
| 6,600 | 33,000 | .013550 | .001050 | ..... | ..... | |
| 6,800 | 34,000 | .015200 | .001650 | ..... | ..... | |
| 7,000 | 35,000 | .017000 | .001800 | ..... | ..... | |
| 10,810 | 54,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 54,050 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .1250 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ".3 from neck |
| Character of broken surface | | dull amorphous; opened cracks along the stem |
| Elongation of inch sections | | ".11, ".14* |

## No. 6422.

Marks, $\frac{A\ 8}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000050 | .000050 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000350 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000350 | ..... | ..... | Elastic limit. |
| 4,200 | 21,000 | .000850 | .000150 | ..... | ..... | |
| 4,400 | 22,000 | .001650 | .000800 | ..... | ..... | |
| 4,600 | 23,000 | .002850 | .001200 | ..... | ..... | |
| 4,800 | 24,000 | .003750 | .000900 | ..... | ..... | |
| 5,000 | 25,000 | .004600 | .000850 | ..... | ..... | |
| 5,200 | 26,000 | .005550 | .000950 | ..... | ..... | |
| 5,400 | 27,000 | .007000 | .001450 | ..... | ..... | |
| 5,600 | 28,000 | .008250 | .001250 | ..... | ..... | |
| 5,800 | 29,000 | .009900 | .001650 | ..... | ..... | |
| 6,000 | 30,000 | .011250 | .001350 | ..... | ..... | |
| 11,280 | 56,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,400 |
| Elastic limit per square inch of original section | do... | 20,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .000700 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | dull amorphous |
| Elongation of inch sections | | ".19, ".23* |

## No. 6196.

Marks, $\frac{A\ 9}{I\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000050 | .000050 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 4,200 | 21,000 | .000650 | .000050 | ..... | ..... | |
| 4,400 | 22,000 | .000750 | .000100 | ..... | ..... | Elastic limit. |
| 4,600 | 23,000 | .000950 | .000200 | ..... | ..... | |
| 4,800 | 24,000 | .001550 | .000600 | ..... | ..... | |
| 5,000 | 25,000 | .002250 | .001700 | ..... | ..... | |
| 5,200 | 26,000 | .005000 | .001750 | ..... | ..... | |
| 5,400 | 27,000 | .006000 | .001000 | ..... | ..... | |
| 5,600 | 28,000 | .007500 | .001500 | ..... | ..... | |
| 5,800 | 29,000 | .008250 | .000750 | ..... | ..... | |
| 6,000 | 30,000 | .010000 | .001750 | .008850 | .008850 | |
| 6,200 | 31,000 | .011500 | .001500 | ..... | ..... | |
| 6,400 | 32,000 | .012450 | .000950 | ..... | ..... | |
| 6,600 | 33,000 | .014150 | .001700 | ..... | ..... | |
| 6,800 | 34,000 | .016050 | .001900 | ..... | ..... | |
| 7,000 | 35,000 | .017550 | .001500 | ..... | ..... | |
| 11,300 | 56,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,500 |
| Elastic limit per square inch of original section | do... | 22,000 |
| Elongation per inch after rupture | inch.. | .1250 |
| Elongation per inch under strain at elastic limit | do... | .000750 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ″.4 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ″.18⁰, ″.09 |

## No. 6197.

**Marks,** $\frac{A\ 10}{I\ B\ 15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000200 | ..... | ..... | Elastic limit. |
| 4,200 | 21,000 | .000850 | .000300 | ..... | ..... | |
| 4,400 | 22,000 | .001000 | .000150 | ..... | ..... | |
| 4,600 | 23,000 | .001200 | .000200 | ..... | ..... | |
| 4,800 | 24,000 | .001600 | .000400 | ..... | ..... | |
| 5,000 | 25,000 | .002100 | .000500 | ..... | ..... | |
| 5,200 | 26,000 | .003500 | .001400 | ..... | ..... | |
| 5,400 | 27,000 | .005750 | .002250 | ..... | ..... | |
| 5,600 | 28,000 | .007400 | .001650 | ..... | ..... | |
| 5,800 | 29,000 | .009000 | .001600 | ..... | ..... | |
| 6,000 | 30,000 | .010100 | .001100 | .009000 | .009000 | |
| 6,200 | 31,000 | .011250 | .001150 | ..... | ..... | |
| 6,400 | 32,000 | .013100 | .001850 | ..... | ..... | |
| 6,600 | 33,000 | .014500 | .001400 | ..... | ..... | |
| 6,800 | 34,000 | .016050 | .001550 | ..... | ..... | |
| 7,000 | 35,000 | .018400 | .002350 | ..... | ..... | |
| 11,390 | 56,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,950 |
| Elastic limit per square inch of original section | do... | 20,000 |
| Elongation per inch after rupture | inch.. | .1650 |
| Elongation per inch under strain at elastic limit | do... | .000650 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".5 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".12, ".21* |

## No. 6423.

Marks, $\frac{A\ 10.}{2\ I\ B\ 15.}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15.000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000750 | .000250 | ..... | ..... | |
| 4,200 | 21,000 | .000800 | .000050 | ..... | ..... | |
| 4,400 | 22,000 | .000850 | .000050 | ..... | ..... | Elastic limit. |
| 4,600 | 23,000 | .001350 | .000500 | ..... | ..... | |
| 4,800 | 24,000 | .002000 | .000650 | ..... | ..... | |
| 5,000 | 25,000 | .002950 | .000950 | ..... | ..... | |
| 5,200 | 26,000 | .004100 | .001150 | ..... | ..... | |
| 5,400 | 27,000 | .005400 | .001300 | ..... | ..... | |
| 5,600 | 28,000 | .006600 | .001200 | ..... | ..... | |
| 5,800 | 29,000 | .007950 | .001350 | ..... | ..... | |
| 6,000 | 30,000 | .009500 | .001550 | ..... | ..... | |
| 10,710 | 53,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 53,550 |
| Elastic limit per square inch of original section | do... | 22,000 |
| Elongation per inch after rupture | inch.. | .1150 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".95 from neck |
| Character of broken surface.... granular, 40 per cent; dull amorphous, 60 per cent. Contains a seam | | |
| Elongation of inch sections | | ".13*, ".10 |

## No. 6271.

Marks, $\frac{A\ 11}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000850 | .000350 | .000300 | .000300 | Elastic limit. |
| 4,200 | 21,000 | .002100 | .001250 | ..... | ..... | |
| 4,400 | 22,000 | .008150 | .001050 | ..... | ..... | |
| 4,600 | 23,000 | .004500 | .001350 | ..... | ..... | |
| 4,800 | 24,000 | .005500 | .001000 | ..... | ..... | |
| 5,000 | 25,000 | .006900 | .001400 | ..... | ..... | |
| 5,200 | 26,000 | .008100 | .001200 | ..... | ..... | |
| 5,400 | 27,000 | .009550 | .001450 | ..... | ..... | |
| 5,600 | 28,000 | .011000 | .001450 | ..... | ..... | |
| 5,800 | 29,000 | .012600 | .001600 | ..... | ..... | |
| 6,000 | 30,000 | .014500 | .001900 | ..... | ..... | |
| 11,170 | 55,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 55,850 |
| Elastic limit per square inch of original section | do... | 20,000 |
| Elongation per inch after rupture | inch.. | .2950 |
| Elongation per inch under strain at elastic limit | do... | .000850 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 87.1 |
| Position of rupture | | 1".00 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".36*, ".23 |

## No. 6272.

Marks, $\frac{A\ 12}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000100 | 0. | ..... | |
| 5,000 | 25,000 | .000850 | .000250 | ..... | ..... | |
| 5,600 | 28,000 | .001050 | .000200 | ..... | ..... | Elastic limit. |
| 5,800 | 29,000 | .004500 | .008450 | ..... | ..... | |
| 6,000 | 30,000 | .005500 | .001000 | ..... | ..... | |
| 6,200 | 31,000 | .006450 | .000950 | ..... | ..... | |
| 6,400 | 32,000 | .007600 | .001150 | ..... | ..... | |
| 6,600 | 33,000 | .008850 | .001250 | ..... | ..... | |
| 6,800 | 34,000 | .010000 | .001150 | ..... | ..... | |
| 7,000 | 35,000 | .010850 | .000850 | ..... | ..... | |
| 13,080 | 65,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,400 |
| Elastic limit per square inch of original section | do... | 28,000 |
| Elongation per inch after rupture | inch... | 1200 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".35 from neck |
| Character of broken surface | | granular, silky spot at the circumference |
| Elongation of inch sections | | ".14". ".12 |

## No. 6424.

Marks, $\overset{A\ 12}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000250 | ..... | ..... | |
| 5,400 | 27,000 | .001000 | .000100 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .002150 | .001150 | ..... | ..... | |
| 5,800 | 29,000 | .004100 | .001950 | ..... | ..... | |
| 6,000 | 30,000 | .008000 | .003900 | ..... | ..... | |
| 6,200 | 31,000 | .009900 | .001900 | ..... | ..... | |
| 6,400 | 32,000 | .011050 | .001150 | ..... | ..... | |
| 6,600 | 33,000 | .012000 | .000950 | ..... | ..... | |
| 6,800 | 34,000 | .014150 | .002150 | ..... | ..... | |
| 7,000 | 35,000 | .015000 | .000850 | ..... | ..... | |
| 12,320 | 61,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 61,600 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .1650 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".1 from neck |
| Character of broken surface | | dull amorphous; seam at the circumference |
| Elongation of inch sections | | ".20*, ".13 |

## No. 6396.

Marks, $\frac{A\ 14}{2\ I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000550 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000750 | .000200 | ..... | ..... | |
| 4,400 | 22,000 | .000900 | .000150 | ..... | ..... | |
| 4,600 | 23,000 | .000950 | .000050 | ..... | ..... | Elastic limit. |
| 4,800 | 24,000 | .001450 | .000500 | ..... | ..... | |
| 5,000 | 25,000 | .004400 | .002950 | ..... | ..... | |
| 5,200 | 26,000 | .005450 | .001050 | ..... | ..... | |
| 5,400 | 27,000 | .006750 | .001300 | ..... | ..... | |
| 5,600 | 28,000 | .008350 | .001600 | ..... | ..... | |
| 5,800 | 29,000 | .009950 | .001600 | ..... | ..... | |
| 6,000 | 30,000 | .011100 | .001150 | ..... | ..... | |
| 6,400 | 32,000 | .014000 | .002900 | ..... | ..... | |
| 6,800 | 34,000 | .017000 | .003000 | ..... | ..... | |
| 7,200 | 36,000 | .020000 | .003000 | ..... | ..... | |
| 7,600 | 38,000 | .023750 | .003750 | ..... | ..... | |
| 8,000 | 40,000 | .028000 | .004250 | ..... | ..... | |
| 8,400 | 42,000 | .032500 | .004500 | ..... | ..... | |
| 8,800 | 44,000 | .037100 | .004600 | ..... | ..... | |
| 9,200 | 46,000 | .043250 | .006150 | ..... | ..... | |
| 9,600 | 48,000 | .049500 | .006250 | ..... | ..... | |
| 10,000 | 50,000 | .057000 | .007500 | ..... | ..... | |
| 12,020 | 60,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 60,100 |
| Elastic limit per square inch of original section | do... | 23,000 |
| Elongation per inch after rupture | inch.. | .2050 |
| Elongation per inch under strain at elastic limit | do... | .000950 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | dull amorphous, oblique |
| Elongation of inch sections | | ".25*, ".16 |

## No. 6273.

**Marks,** $\frac{A\ 15}{I\ B\ 15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000550 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000250 | .000050 | .000050 | |
| 5,000 | 25,000 | .001050 | .000250 | ..... | ..... | Elastic limit. |
| 5,200 | 26,000 | .002000 | .000950 | ..... | ..... | |
| 5,400 | 27,000 | .004000 | .002000 | ..... | ..... | |
| 5,600 | 28,000 | .008000 | .004000 | ..... | ..... | |
| 5,800 | 29,000 | .010750 | .002750 | ..... | ..... | |
| 6,000 | 30,000 | .011750 | .001000 | ..... | ..... | |
| 9,480 | 47,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 47,400 |
| Elastic limit per square inch of original section | do... | 25,000 |
| Elongation per inch after rupture | inch.. | .0900 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ".25 from neck |
| Character of broken surface | | dull amorphous, 60 per cent; granular 40 per cent |
| Elongation of inch sections | | ".05, ".13[a] |

## No. 6278.

Marks, $\frac{A-15}{I-B-15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | 0. | ..... | |
| 5,000 | 25,000 | .000850 | .000250 | ..... | ..... | |
| 5,800 | 29,000 | .001000 | .000150 | ..... | ..... | Elastic limit. |
| 6,000 | 30,000 | .001500 | .000500 | ..... | ..... | |
| 6,200 | 31,000 | .006100 | .006600 | ..... | ..... | |
| 6,400 | 32,000 | .009400 | .001300 | ..... | ..... | |
| 6,600 | 33,000 | .010550 | .001150 | ..... | ..... | |
| 6,800 | 34,000 | .011550 | .001000 | ..... | ..... | |
| 7,000 | 35,000 | .012500 | .000950 | ..... | ..... | |
| 13,530 | 67,650 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 67,650 |
| Elastic limit per square inch of original section | do... | 29,000 |
| Elongation per inch after rupture | inch.. | .2450 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | 1″.05 from neck |
| Character of broken surface | | silky, 50 per cent; granular, 50 per cent |
| Elongation of inch sections | | ″.250, ″.24 |

## No. 6279.

**Marks,** $\frac{A\text{-}16}{1\text{-}B\text{-}15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | 0. | ..... | |
| 5,000 | 25,000 | .000800 | .000200 | ..... | ..... | |
| 5,800 | 29,000 | .000950 | .000150 | ..... | ..... | Elastic limit. |
| 6,000 | 30,000 | .012500 | .011550 | ..... | ..... | |
| 6,200 | 31,000 | .014250 | .001750 | ..... | ..... | |
| 6,400 | 32,000 | .015500 | .001250 | ..... | ..... | |
| 6,600 | 33,000 | .017000 | .001500 | ..... | ..... | |
| 6,800 | 34,000 | .018300 | .001300 | ..... | ..... | |
| 7,000 | 35,000 | .020000 | .001700 | ..... | ..... | |
| 12,280 | 61,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 61,400 |
| Elastic limit per square inch of original section | do... | 29,000 |
| Elongation per inch after rupture | inch.. | .3050 |
| Elongation per inch under strain at elastic limit | do... | .000950 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".31*, ".30* |

## No. 6274.

Marks, $\frac{A-17}{I-B-15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch,* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000500 | .000100 | 0. | ..... | |
| 5,000 | 25,000 | .000900 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000150 | .000050 | .000050 | Elastic limit. |
| 6,200 | 31,000 | .006000 | .004950 | ..... | ..... | |
| 6,400 | 32,000 | .013750 | .007750 | ..... | ..... | |
| 6,600 | 33,000 | .014550 | .000800 | ..... | ..... | |
| 6,800 | 34,000 | .015650 | .001100 | ..... | ..... | |
| 7,000 | 35,000 | .017750 | .002100 | ..... | ..... | |
| 11,740 | 58,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 58,700 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ″.5 from neck |
| Character of broken surface | | dull amorphous, oblique surface |
| Elongation of inch sections | | ″.20, ″.10 |

## No. 6320.

**Marks,** $\frac{A\ 13}{L\ B.\ 15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | .000050 | .000050 | |
| 7,400 | 37,000 | .001150 | .000200 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .013500 | .002350 | ..... | ..... | |
| 7,800 | 39,000 | .015350 | .001850 | ..... | ..... | |
| 8,000 | 40,000 | .017000 | .001650 | ..... | ..... | |
| 8,200 | 41,000 | .018000 | .001000 | ..... | ..... | |
| 8,400 | 42,000 | .019500 | .001500 | ..... | ..... | |
| 14,020 | 70,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 70,100 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".22", ".18 |

## No. 6321.

Marks, $\frac{A\ 19}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | 0. | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | Elastic limit. |
| 7,200 | 36,000 | .011000 | .009800 | ..... | ..... | |
| 7,400 | 37,000 | .012000 | .001000 | ..... | ..... | |
| 7,600 | 38,000 | .012750 | .000750 | ..... | ..... | |
| 7,800 | 39,000 | .013500 | .000750 | ..... | ..... | |
| 8,000 | 40,000 | .014650 | .001150 | ..... | ..... | |
| 14,510 | 72,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 72,550 |
| Elastic limit per square inch of original section | do... | 35,000 |
| Elongation per inch after rupture | inch.. | .2050 |
| Elongation per inch under strain at elastic limit | do... | .001200 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | granular 40 per cent, dull amorphous 60 per cent |
| Elongation of inch sections | | ".21, ".20 |

## N. 6322.

Marks, $\frac{A\ 20}{I.\ B.\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000200 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000250 | ..... | ..... | |
| 5,200 | 26,000 | .000950 | .000950 | ..... | ..... | |
| 5,400 | 27,000 | .001050 | .000100 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .001550 | .000500 | ..... | ..... | |
| 5,800 | 29,000 | .003000 | .001450 | ..... | ..... | |
| 6,000 | 30,000 | .004050 | .001050 | ..... | ..... | |
| 6,200 | 31,000 | .005050 | .001000 | ..... | ..... | |
| 6,400 | 32,000 | .006000 | .000950 | ..... | ..... | |
| 14,100 | 70,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 70,500 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | .23*, .*23 |

## No. 6335.

Marks, $\frac{A\ 21.}{I\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000100 | ..... | ..... | |
| 5,000 | 25,000 | .000900 | .000350 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000100 | ..... | ..... | Elastic limit. |
| 5,400 | 27,000 | .001450 | .000450 | ..... | ..... | |
| 5,600 | 28,000 | .002750 | .001300 | ..... | ..... | |
| 5,800 | 29,000 | .004250 | .001500 | ..... | ..... | |
| 6,000 | 30,000 | .005600 | .001350 | ..... | ..... | |
| 13,110 | 65,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,550 |
| Elastic limit per square inch of original section | do... | 26,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .001000 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | 1″.1 from neck |
| Character of broken surface | | granular, interspersed with dull amorphous metal |
| Elongation of inch sections | | ″.26*, ″.20 |

## No. 6348.

Marks, $\frac{A\ 22}{I\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000200 | ..... | ..... | |
| 4,200 | 21,000 | .000750 | .000100 | ..... | ..... | Elastic limit. |
| 4,400 | 22,000 | .001050 | .000300 | ..... | ..... | |
| 4,600 | 23,000 | .001500 | .000450 | ..... | ..... | |
| 4,800 | 24,000 | .002150 | .000650 | ..... | ..... | |
| 5,000 | 25,000 | .003400 | .001250 | ..... | ..... | |
| 5,200 | 26,000 | .004550 | .001150 | ..... | ..... | |
| 5,400 | 27,000 | .005800 | .001250 | ..... | ..... | |
| 5,600 | 28,000 | .007350 | .001550 | ..... | ..... | |
| 5,800 | 29,000 | .008500 | .001150 | ..... | ..... | |
| 6,000 | 30,000 | .009150 | .000650 | ..... | ..... | |
| 12,520 | 62,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 62,600 |
| Elastic limit per square inch of original section | do... | 21,000 |
| Elongation per inch after rupture | inch.. | .3250 |
| Elongation per inch under strain at elastic limit | do... | .000750 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | ″.1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.23, ″.42* |

## No. 6363.

Marks, $\frac{A\ 23}{I\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000100 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000100 | ..... | ..... | |
| 4,600 | 23,000 | .000700 | .000150 | ..... | ..... | |
| 4,800 | 24,000 | .000800 | .000100 | ..... | ..... | Elastic limit. |
| 5,000 | 25,000 | .001100 | .000300 | ..... | ..... | |
| 5,200 | 26,000 | .001500 | .000400 | ..... | ..... | |
| 5,400 | 27,000 | .001800 | .000300 | ..... | ..... | |
| 5,600 | 28,000 | .002400 | .000600 | ..... | ..... | |
| 5,800 | 29,000 | .003600 | .001200 | ..... | ..... | |
| 6,000 | 30,000 | .004600 | .001000 | ..... | ..... | |
| 13,390 | 66,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 66,950 |
| Elastic limit per square inch of original section | do... | 24,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .000800 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ″.8 from neck |
| Character of broken surface | | granular, dull, silky spot at the circumference |
| Elongation of inch sections | | ″.17, ″.23* |

## No. 6364.

**Marks,** $\frac{A\ 24}{I\ B\ 15}$
**Diameter,** ".505.
**Sectional area,** .20 square inch.
**Gauged length,** 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000250 | ..... | ..... | |
| 4,400 | 22,000 | .000800 | .000100 | ..... | ..... | Elastic limit. |
| 4,600 | 23,000 | .001100 | .000300 | ..... | ..... | |
| 4,800 | 24,000 | .001450 | .000350 | ..... | ..... | |
| 5,000 | 25,000 | .001850 | .000400 | ..... | ..... | |
| 5,200 | 26,000 | .002250 | .000400 | ..... | ..... | |
| 5,400 | 27,000 | .003050 | .000800 | ..... | ..... | |
| 5,600 | 28,000 | .003800 | .000750 | ..... | ..... | |
| 5,800 | 29,000 | .004750 | .000950 | ..... | ..... | |
| 6,000 | 30,000 | .005650 | .000900 | ..... | ..... | |
| 13,260 | 66,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 66,300 |
| Elastic limit per square inch of original section | do... | 22,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .000800 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 30.7 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | granular 40 per cent, silky 60 per cent |
| Elongation of inch sections | | ".16, ".29 |

## No. 6431.

Marks, $\frac{A\ 25}{I\ B\ 15}$
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000200 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | ..... | ..... | |
| 6,200 | 31,000 | .001100 | .000100 | ..... | ..... | |
| 6,400 | 32,000 | .001100 | 0. | ..... | ..... | Elastic limit. |
| 6,600 | 33,000 | .010100 | .009000 | ..... | ..... | |
| 6,800 | 34,000 | .010500 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .011650 | .001150 | ..... | ..... | |
| 7,200 | 36,000 | .012650 | .001000 | ..... | ..... | |
| 7,400 | 37,000 | .013500 | .000850 | ..... | ..... | |
| 7,600 | 38,000 | .015400 | .001900 | ..... | ..... | |
| 7,800 | 39,000 | .016500 | .001100 | ..... | ..... | |
| 8,000 | 40,000 | .019250 | .002750 | ..... | ..... | |
| 8,200 | 41,000 | .019500 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .021000 | .001500 | ..... | ..... | |
| 13,590 | 67,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 67,950 |
| Elastic limit per square inch of original section | do... | 32,000 |
| Elongation per inch after rupture | inch.. | .2350 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ″.75 from neck |
| Character of broken surface | | dull silky 90 per cent, granular 10 per cent |
| Elongation of inch sections | | ″.19, ″.28* |

## No. 6437.

Marks, $\frac{A\ 27}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 3,000 | 15,000 | .000450 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | ..... | ..... | Elastic limit. |
| 6,200 | 31,000 | .009650 | .008650 | ..... | ..... | |
| 6,400 | 32,000 | .010350 | .000700 | ..... | ..... | |
| 6,600 | 33,000 | .011000 | .000650 | ..... | ..... | |
| 6,800 | 34,000 | .012200 | .001200 | ..... | ..... | |
| 7,000 | 35,000 | .013400 | .001200 | ..... | ..... | |
| 7,200 | 36,000 | .014500 | .001100 | ..... | ..... | |
| 7,400 | 37,000 | .016000 | .001500 | ..... | ..... | |
| 7,600 | 38,000 | .017500 | .001500 | ..... | ..... | |
| 7,800 | 39,000 | .018750 | .001250 | ..... | ..... | |
| 8,000 | 40,000 | .021700 | .002950 | ..... | ..... | |
| 8,200 | 41,000 | .022250 | .000550 | ..... | ..... | |
| 13,190 | 65,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,950 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch... | .2000 |
| Elongation per inch under strain at elastic limit | do.... | .001000 |
| Reduction in diameter at point of rupture | do.... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".50 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".25, .35" |

## No. 6435.

Marks, $\frac{A\ 28}{I\ B\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,000 | 15.000 | .000450 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000750 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000300 | ..... | ..... | Elastic limit. |
| 6,200 | 31,000 | .009200 | .008150 | ..... | ..... | |
| 6,400 | 32,000 | .009650 | .000450 | ..... | ..... | |
| 6,600 | 33,000 | .011150 | .001500 | ..... | ..... | |
| 6,800 | 34,000 | .012500 | .001350 | ..... | ..... | |
| 7,000 | 35,000 | .013250 | .000750 | ..... | ..... | |
| 7,200 | 36,000 | .015000 | .001750 | ..... | ..... | |
| 7,400 | 37,000 | .016250 | .001250 | ..... | ..... | |
| 7,600 | 38,000 | .017650 | .001400 | ..... | ..... | |
| 7,800 | 39,000 | .019000 | .001350 | ..... | ..... | |
| 8,000 | 40,000 | .020500 | .001500 | ..... | ..... | |
| 8,200 | 41,000 | .022250 | .001750 | ..... | ..... | |
| 13,090 | 65,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 65,450 |
| Elastic limit per square inch of original section | do... | 30,000 |
| Elongation per inch after rupture | inch.. | .3250 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1".20 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ".38*, ".27 |

# PISTON RODS—15-POUNDER GUN MOUNTS.

## STEEL FORGINGS.

## No. 6176.

Marks, $\frac{A\text{-}1}{P\ R\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | ..... | ..... | |
| 8,200 | 41,000 | .001300 | 0. | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000100 | ..... | ..... | |
| 8,600 | 43,000 | .001450 | .000350 | ..... | ..... | |
| 8,800 | 44,000 | .001500 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001500 | 0. | ..... | ..... | |
| 9,200 | 46,000 | .001500 | 0. | ..... | ..... | |
| 9,400 | 47,000 | .001500 | 0. | ..... | ..... | |
| 9,600 | 48,000 | .001500 | 0. | ..... | ..... | |
| 9,800 | 49,000 | .001600 | .000100 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | 0. | ..... | ..... | |
| 10,200 | 51,000 | .001650 | .000050 | ..... | ..... | |
| 10,400 | 52,000 | .001700 | .000050 | ..... | ..... | |
| 10,600 | 53,000 | .001700 | 0. | ..... | ..... | |
| 10,800 | 54,000 | .001750 | .000050 | ..... | ..... | Elastic limit. |
| 11,000 | 55,000 | .009100 | .007350 | ..... | ..... | |
| 11,200 | 56,000 | .009350 | .000250 | ..... | ..... | |
| 11,400 | 57,000 | .009750 | .000400 | ..... | ..... | |
| 11,600 | 58,000 | .010250 | .000500 | ..... | ..... | |
| 11,800 | 59,000 | .010600 | .000350 | ..... | ..... | |
| 12,000 | 60,000 | .011300 | .000700 | ..... | ..... | |
| 21,790 | 108,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 108,950 |
| Elastic limit per square inch of original section | do... | 54,000 |
| Elongation per inch after rupture | inch.. | .1400 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ".38 from neck |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ".19", ".09 |

## No. 6177.

Marks, $\frac{A\text{-}2}{P.\ R.\ 15}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000050 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000400 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | ..... | ..... | |
| 8,200 | 41,000 | .001350 | .000350 | ..... | ..... | |
| 8,400 | 42,000 | .001400 | .000050 | ..... | ..... | |
| 8,600 | 43,000 | .001450 | .000050 | ..... | ..... | |
| 8,800 | 44,000 | .001500 | .000050 | ..... | ..... | |
| 9,000 | 45,000 | .001500 | 0. | ..... | ..... | |
| 9,200 | 46,000 | .001500 | 0. | ..... | ..... | |
| 9,400 | 47,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 9,600 | 48,000 | .006250 | .004700 | ..... | ..... | |
| 9,800 | 49,000 | .006550 | .000300 | ..... | ..... | |
| 10,000 | 50,000 | .007000 | .000450 | ..... | ..... | |
| 10,200 | 51,000 | .007400 | .000400 | ..... | ..... | |
| 10,400 | 52,000 | .007750 | .000350 | ..... | ..... | |
| 10,600 | 53,000 | .008250 | .000500 | ..... | ..... | |
| 21,390 | 106,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 106,950 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .1550 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ".52 from neck |
| Character of broken surface | | fine granular, silky center |
| Elongation of inch sections | | ".10, ".21* |

## No. 6173.

Marks, $\frac{A\text{-}S}{P\ R\ 15}$.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000050 | .000050 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | 0. | ..... | |
| 8,000 | 40,000 | .001250 | .000300 | 0. | ..... | |
| 9,000 | 45,000 | .001500 | .000250 | ..... | ..... | |
| 9,200 | 46,000 | .001500 | 0. | ..... | ..... | |
| 9,400 | 47,000 | .001500 | 0. | ..... | ..... | |
| 9,600 | 48,000 | .001550 | .000050 | ..... | ..... | |
| 9,800 | 49,000 | .001600 | .000050 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | 0. | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000100 | ..... | ..... | |
| 10,400 | 52,000 | .001700 | 0. | ..... | ..... | Elastic limit. |
| 10,600 | 53,000 | .006750 | .004050 | ..... | ..... | |
| 10,800 | 54,000 | .006000 | .000250 | ..... | ..... | |
| 11,000 | 55,000 | .006250 | .000250 | ..... | ..... | |
| 11,200 | 56,000 | .006550 | .000300 | ..... | ..... | |
| 11,400 | 57,000 | .007050 | .000500 | ..... | ..... | |
| 11,600 | 58,000 | .007600 | .000550 | ..... | ..... | |
| 22,490 | 112,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 112,450 |
| Elastic limit per square inch of original section | do... | 52,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ″.13*, ″.11 |

## No. 6171.

Marks, $\frac{A-4}{P\ R\ 15}$.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | ..... | ..... | |
| 9,000 | 45,000 | .001550 | .000200 | ..... | ..... | |
| 9,200 | 46,000 | .001600 | .000050 | ..... | ..... | |
| 9,400 | 47,000 | .001650 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001650 | 0. | ..... | ..... | |
| 9,800 | 49,000 | .001650 | 0. | ..... | ..... | |
| 10,000 | 50,000 | .001700 | .000050 | ..... | ..... | |
| 10,200 | 51,000 | .001750 | .000050 | ..... | ..... | Elastic limit. |
| 10,400 | 52,000 | .008450 | .006700 | ..... | ..... | |
| 10,600 | 53,000 | .008500 | .000050 | ..... | ..... | |
| 10,800 | 54,000 | .008500 | 0. | ..... | ..... | |
| 11,000 | 55,000 | .008600 | .000100 | ..... | ..... | |
| 11,200 | 56,000 | .008750 | .000150 | ..... | ..... | |
| 11,400 | 57,000 | .009000 | .000250 | ..... | ..... | |
| 22,290 | 111,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 111,450 |
| Elastic limit per square inch of original section | do... | 51,000 |
| Elongation per inch after rupture | inch.. | .1950 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 23.9 |
| Position of rupture | | ".55 from neck |
| Character of broken surface | | fine granular |
| Elongation of inch sections | | ".21*, ".18 |

## *TABULATION OF STEEL SPECIMENS FROM 6-POUNDER AND 15-POUNDER GUN MOUNTS (STEMS 2″ LONG).*

### PIVOT SOCKETS, 6-POUNDER GUN MOUNTS. STEEL CASTINGS.

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per squ're inch. | Elongation in 2 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | ″ | ″ |
| 6170 | A 2 P S 6 | .505 | .20 | *a* 20,000 | 54,450 | 13.5 | 16.9 | Granular, dark spot at circumference. | .12, | .15* |
| 6219 | A 6 P S 6 | .505 | .20 | 21,000 | 58,200 | 30.0 | 40.3 | Dull silky | .32*, | .28* |
| 6220 | A 7 P S 6 | .505 | .20 | 19,000 | 57,800 | 26.0 | 37.1 | .....do | .21, | .31* |
| 6221 | A 8 P S 6 | .505 | .20 | 43,000 | 99,600 | 11.0 | 9.5 | Granular, dull spot at circumference; opened cracks in surface of stem | .11*, | .11 |
| 6222 | A 9 P S 6 | .505 | .20 | 20,000 | 60,150 | 22.5 | 27.4 | Dull amorphous | .25*, | .20 |
| 6223 | A 10 P S 6 | .505 | .20 | 21,000 | 99,900 | 21.0 | 20.5 | Dull, silky; trace of granulation | .18, | .24* |
| 6224 | A 11 P S 6 | .505 | .20 | 20,000 | 60,550 | 24.0 | 30.7 | Dull amorphous | .20, | .28* |
| 6225 | A 12 P S 6 | .505 | .20 | 20,000 | 59,850 | 21.5 | 27.4 | .....do | .18, | .25* |
| 6237 | A 13 P S 6 | .505 | .20 | 25,000 | 55,400 | 35.0 | 54.6 | Silky | .42*, | .28 |
| 6238 | A 14 P S 6 | .505 | .20 | 33,000 | 59,550 | 35.0 | 59.8 | .....do | .31, | .39* |
| 6239 | A 15 P S 6 | .505 | .20 | 31,000 | 66,100 | 25.5 | 34.0 | Silky, oblique | .30*, | .21 |
| 6240 | A 16 P S 6 | .505 | .20 | 27,000 | 54,600 | 37.0 | 57.2 | Silky | .31, | .43* |
| 6241 | A 17 P S 6 | .505 | .20 | 31,000 | 60,900 | 21.5 | 27.4 | Dull gray, amorphous | .17, | .26* |
| 6242 | A 18 P S 6 | .505 | .20 | 30,000 | 61,050 | 21.0 | 28.9 | .....do | .19, | .28* |
| 6275 | A 19 P S 6 | .505 | .20 | 35,000 | 70,500 | 22.5 | 30.7 | Silky, serrated | .25*, | .20 |
| 6276 | A 20 P S 6 | .505 | .20 | 39,000 | 74,250 | 17.0 | 20.5 | Granular 60 per cent, silky 40 per cent | .19* | .15 |
| 6298 | A 21 P S 6 | .505 | .20 | *b* 25,000 | 67,200 | 30.0 | 43.3 | Dull silky | .28, | .32* |
| 6299 | A 22 P S 6 | .505 | .20 | 26,000 | 73,550 | 19.5 | 40.3 | Granular, silky spot at circumference | .21*. | .18 |

*a* Below. *b* About.

*TABULATION OF STEEL SPECIMENS FROM 6-POUNDER AND 15-POUNDER GUN MOUNTS (STEMS 2″ LONG)*—Continued.

PISTON RODS, 6-POUNDER GUN MOUNTS. STEEL FORGINGS.

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per squ're inch. | Elongation in 2 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | ″ ″ |
| 6202 | A 1 P R 6 | .505 | .20 | 64,000 | 81,550 | 10.0 | 13.2 | Fine granular | .10*, .10* |
| 6198 | A 2 P R 6 | .505 | .20 | 62,000 | 105,500 | 11.0 | 13.2 | Fine granular, radiating from the center | .11*, .11 |
| 6297 | A 3 P R 6 | .505 | .20 | 65,000 | 120,100 | 9.5 | 13.2 | Fine granular, radiating from center punch defining inch section on stem | .10*, .09* |
| 6305 | A 4 P R 6 | .505 | .20 | 44,000 | 101,000 | 14.0 | 20.5 | Fine granular, with a circle of coarser granulation ¼″ diameter | .10, .18* |
| 6334 | A 5 P R 6 | .505 | .20 | 60,000 | 119,000 | 9.5 | 13.2 | Fine granular | .08, .11* |
| 6354 | A 6 P R 6 | .505 | .20 | 45,000 | 114,050 | 11.5 | 16.9 | Granular | .13*, .10 |
| 6367 | A 7 P R 6 | .505 | .20 | 56,000 | 117,050 | 11.5 | 13.2 | Fine granular | .14*, .09 |
| 6257 | A 12 P R 6 | .505 | .25 | 29,000 | 83,400 | 11.0 | 16.9 | .....do | .10, .12* |
| 6386 | A 21 P R 6 | .505 | .25 | 50,000 | 99,900 | 21.0 | 37.1 | Silky | .25*, .17 |
| 6387 | A 22 P R 6 | .505 | .25 | 48,000 | 98,550 | 21.5 | 40.8 | .....do | .14, .29* |

AXLE 6-POUNDER GUN MOUNT. STEEL FORGING.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6175 | A 1 A 6 | .505 | .20 | a38,000 | 77,400 | ..... | 49.1 | Silky | .29*, .26 |

PIVOT SOCKETS, 15-POUNDER GUN MOUNTS. STEEL CASTINGS.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6172 | A 1 P S 15 | .505 | .20 | 24,000 | 58,400 | 14.0 | 16.9 | Granular 60 per cent, dull silky 40 per cent | .12, .16* |
| 6174 | A 2 P S 15 | .505 | .20 | 18,000 | 33,200 | 6.5 | 9.5 | Discolored, spongy | .10*, .05 |
| 6195 | A 2 P S 15 | .505 | .20 | a23,000 | 54,100 | 11.5 | 16.9 | Coarse granular 70 per cent, dull silky 30 per cent | .14*, .09 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6201 | A 5<br>P S 15 | .505 | .20 | 24,000 | 68,350 | 20.0 | 27.4 | Dull gray, amorphous | .17, | .23* |
| 6280 | A 11<br>P S 15 | .505 | .20 | 39,000 | 75,050 | 17.5 | 20.5 | Granular 60 per cent, dull silky 40 per cent | .19*, | .16 |
| 6281 | A 12<br>P S 15 | .505 | .20 | 38,000 | 74,450 | 20.5 | 27.4 | Dull amorphous | .16, | .25* |
| 6282 | A 13<br>P S 15 | .505 | .20 | 34,000 | 65,500 | 8.5 | 9.5 | Granular 70 per cent, dull flaky 30 per cent | .10, | .07 |
| 6429 | A 13<br>2 P S 15 | .505 | .20 | 29,000 | 60,400 | 12.5 | 13.2 | Granular 50 per cent, silky 50 per cent | .08, | .17* |
| 6283 | A 14<br>P S 15 | .505 | .20 | 34,000 | 71,050 | 21.0 | 30.7 | Dull silky | .25*, | .17 |
| 6284 | A 15<br>P S 15 | .496 | .1982 | 35,000 | 72,000 | 22.5 | 28.3 | .....do | .26*, | .19 |
| 6341 | A 16<br>P S 15 | .505 | .20 | 34,000 | 72,100 | 23.5 | 37.1 | .....do | .28*, | .19 |
| 6342 | A 17<br>P S 15 | .501 | .197 | 31,000 | 70,510 | 24.0 | 29.7 | Dull silky 70 per cent, granular 30 per cent | .24*, | .24* |
| 6343 | A 18<br>P S 15 | .505 | .20 | 33,000 | 69,050 | 23.0 | 27.4 | Dull silky, serrated | .25*, | .28* |
| 6344 | A 19<br>P S 15 | .505 | .20 | 27,000 | 66,500 | 27.0 | 37.1 | Silky, oblique | .22, | .32* |
| 6345 | A 20<br>P S 15 | .505 | .20 | 24,000 | 64,400 | 23.0 | 27.4 | Dull amorphous 70 per cent, granular 30 per cent | .21, | .25* |
| 6346 | A 21<br>P S 15 | .505 | .20 | 26,000 | 66,600 | 27.5 | 37.1 | Dull silky, oblique | .21, | .34* |
| 6347 | A 22<br>P S 15 | .505 | .20 | 24,000 | 68,850 | 26.0 | 40.3 | Dull silky | .34*, | .18 |
| 6359 | A 23<br>P S 15 | .505 | .20 | 19,000 | 58,050 | 32.5 | 40.3 | Silky, oblique | .28, | .37* |
| 6430 | A 23<br>2 P S 15 | .505 | .20 | 18,000 | 54,250 | 13.5 | 16.9 | Granular, spongy spot at circumference | .17*, | .10 |
| 6360 | A 24<br>P S 15 | .505 | .20 | 27,000 | 73,000 | 24.0 | 30.7 | Dull amorphous, oblique | .19, | .29* |
| 6361 | A 25<br>P S 15 | .505 | .20 | 22,000 | 65,550 | 13.0 | 16.9 | Granular 55 per cent, silky center 45 per cent | .11, | .15* |
| 6433 | A 25<br>2 P S 15 | .505 | .20 | 23,000 | 56,900 | 6.0 | 5.7 | Granular, spongy spot at circumference | .06, | .06 |
| 6362 | A 26<br>P S 15 | .505 | .20 | 28,000 | 65,950 | 5.5 | 5.7 | Medium coarse granular | .05*, | .06 |
| 6434 | A 26<br>2 P S 15 | .505 | .20 | 28,000 | 67,400 | 8.0 | 9.5 | Granular | .10*, | .06 |
| 6388 | A 27<br>P S 15 | .505 | .20 | 27,000 | 65,100 | 10.0 | 9.5 | Granular 85 per cent, dull silky 15 per cent | .11*, | .09 |
| 6425 | A 27<br>2 P S 15 | .505 | .20 | 33,000 | 65,500 | 11.0 | 13.2 | .....do | .12*, | .10 |
| 6389 | A 28<br>P S 15 | .505 | .20 | 27,000 | 65,450 | 11.0 | 13.2 | Granular, with silky metal intermingled | .09, | .13* |
| 6426 | A 28<br>2 P S 15 | .505 | .20 | 32,000 | 68,450 | 14.5 | 13.2 | Granular, flaky spot at circumference | .14, | .15* |

*a* About.

*TABULATION OF STEEL SPECIMENS FROM 6-POUNDER AND 15-POUNDER GUN MOUNTS (STEMS 2″ LONG)*—Continued.

PIVOT SOCKETS, 15-POUNDER GUN MOUNTS. STEEL CASTINGS—Continued.

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per squ're inch. | Elongation in 2 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | ″ | ″ |
| 6427 | A 29 P S 15 | .505 | .20 | 28,000 | 68,800 | 20.0 | 20.5 | Granular, silky spot at circumference | .24*, | .16 |
| 6428 | A 30 P S 15 | .505 | .20 | 19,000 | 28,700 | 3.5 | 5.7 | Dull amorphous, granular and spongy parts. Fractured in two places | .06*, | .01 |
| 6436 | A 31 P S 15 | .505 | .20 | 22,000 | 31,800 | 2.0 | ..... | Fine granular 25 per cent, spongy 75 per cent. Opened cracks in surface of stem. Fractured in threaded end. | .02, | .02 |
| 6432 | A 32 P S 15 | .505 | .20 | 34,000 | 69,950 | 22.0 | 34.0 | Dull silky; traces of granulation | .16, | .28* |

INNER BASES, 15-POUNDER GUN MOUNTS. STEEL CASTINGS.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 6199 | A 1 I B 15 | .505 | .20 | 33,000 | 81,900 | 11.0 | 13.2 | Granular, varying from coarse to fine | .10, | .12* |
| 6169 | A 2 I B 15 | .505 | .20 | a 30,000 | 58,400 | 15.0 | 20.5 | Dull silky; trace of granulation | .19*, | .11 |
| 6395 | A 2 2 I B 15 | .505 | .20 | 24,000 | 57,550 | 14.0 | 27.4 | Dull amorphous; opened cracks in surface of stem | .17*, | .11 |
| 6270 | A 5 I B 15 | .505 | .20 | 30,000 | 61,000 | 17.5 | 27.4 | Dull gray amorphous, spongy streak across center | .15, | .20* |
| 6200 | A 6 I B 15 | .505 | .20 | 30,000 | 56,050 | 12.0 | 16.9 | Dull silky oblique; opened cracks in surface of stem | .09, | .15* |
| 6421 | A 6 2 I B 15 | .505 | .20 | 27,000 | 54,050 | 12.5 | 20.5 | Dull amorphous; opened cracks along the stem | .11, | .14* |
| 6422 | A 8 I B 15 | .505 | .20 | 20,000 | 56,400 | 21.0 | 23.9 | Dull amorphous | .19, | .23* |
| 6196 | A 9 I B 15 | .505 | .20 | 22,000 | 56,500 | 13.5 | 20.5 | Dull silky | .18*, | .09 |
| 6197 | A 10 I B 15 | .505 | .20 | 20,000 | 56,950 | 16.5 | 27.4 | .....do | .12, | .21* |
| 6423 | A 10 2 I B 15 | .505 | .20 | 22,000 | 53,550 | 11.5 | 16.9 | Granular 40 per cent, dull amorphous 60 per cent; contains a seam | .13*, | .10 |
| 6271 | A 11 I B 15 | .505 | .20 | 20,000 | 55,850 | 29.5 | 37.1 | Dull silky | .36*, | .23 |
| 6272 | A 12 I B 15 | .505 | .20 | 28,000 | 65,400 | 13.0 | 13.2 | Granular, silky spot at circumference | .14*, | .12 |
| 6424 | A 13 I B 15 | .505 | .20 | 27,000 | 61,600 | 16.5 | 27.4 | Dull amorphous seam at circumference | .20*, | .13 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6396 | A 14 2 I B 15 | .505 | .20 | 23,000 | 60,100 | 20.5 | 27.4 | Dull amorphous, oblique | .25*, .16 |
| 6273 | A 15 I B 15 | .505 | .20 | 25,000 | 47,400 | 9.0 | 20.5 | Dull amorphous 60 per cent, granular 40 per cent | .05, .13* |
| 6278 | A 15 I B 15 | .505 | .20 | 29,000 | 67,650 | 24.5 | 27.4 | Silky 50 per cent, granular 50 per cent | .25*, .24 |
| 6279 | A 16 I B 15 | .505 | .20 | 29,000 | 61,400 | 30.5 | 43.3 | Silky | .31*, .30* |
| 6274 | A 17 I B 15 | .505 | .20 | 30,000 | 58,700 | 15.0 | 23.9 | Dull amorphous, oblique surface | .20*, .10 |
| 6320 | A 18 I B 15 | .505 | .20 | 37,000 | 70,100 | 20.0 | 23.9 | Dull silky | .22*, .18 |
| 6321 | A 19 I B 15 | .505 | .20 | 35,000 | 72,550 | 20.5 | 27.4 | Granular 40 per cent, dull amorphous 60 per cent | .21, .20* |
| 6322 | A 20 I B 15 | .505 | .20 | 27,000 | 70,500 | 23.0 | 20.5 | Granular | .23, .23* |
| 6335 | A 21 I B 15 | .505 | .20 | 26,000 | 65,550 | 23.0 | 23.9 | Granular, interspersed with dull amorphous metal | .26*, .20 |
| 6348 | A 22 I B 15 | .505 | .20 | 21,000 | 62,600 | 32.5 | 49.1 | Silky | .23, .42* |
| 6363 | A 23 I B 15 | .505 | .20 | 24,000 | 66,950 | 20.0 | 23.9 | Granular, dull silky spot at the circumference | .17, .23* |
| 6364 | A 24 I B 15 | .505 | .20 | 22,000 | 66,300 | 22.5 | 30.7 | Granular 40 per cent, silky 60 per cent | .16, .29* |
| 6431 | A 25 I B 15 | .505 | .20 | 32,000 | 67,950 | 23.5 | 23.9 | Dull silky 90 per cent, granular 10 per cent | .19, .28* |
| 6437 | A 27 I B 15 | .505 | .20 | 30,000 | 65,950 | 30.0 | 40.3 | Silky | .25, .35* |
| 6435 | A 28 I B 15 | .505 | .20 | 30,000 | 65,450 | 32.5 | 49.1 | Dull silky | .38*, .27 |

PISTON RODS, 15-POUNDER GUN MOUNTS. STEEL FORGINGS.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6176 | A 1 P R 15 | .505 | .20 | 54,000 | 108,950 | 14.0 | 23.9 | Fine granular | .19*, .09 |
| 6177 | A 2 P R 15 | .505 | .20 | 47,000 | 106,950 | 15.5 | 23.9 | Fine granular, silky center | .10, .21* |
| 6173 | A 3 P R 15 | .505 | .20 | 52,000 | 112,450 | 12.0 | 16.9 | Fine granular | .13*, .11 |
| 6171 | A 4 P R 15 | .505 | .20 | 51,000 | 111,450 | 19.5 | 23.9 | ..... do | .21* .18 |

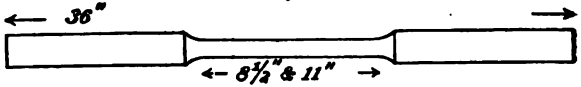
*a* Below.

## SPECIMENS FROM GUN LEVER AXLES FOR 12-INCH DISAPPEARING CARRIAGE.

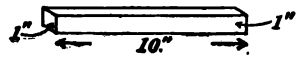
| No. of test. | Diameter. | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 8 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total. | Per square inch. | Total. | Per square inch. | | | | | | |
| | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per ct.* | *In. Sq. in.* | *Per ct.* | | " " " |
| 9537 | .564 | .25 | 10,300 | 41,200 | 22,410 | 89,640 | .37 | 12.3 | Diam. .54=.229 | 8.4 | Granular, medium coarse | .09, .11, .17* |
| 9561 | .564 | .25 | 12,000 | 48,000 | 26,600 | 106,400 | .24 | 8.0 | Diam. .54=.229 | 8.4 | .....do | .07, .07, .10* |

## ANCHOR BOLTS FOR 12-INCH GUN CARRIAGES.

*Tension specimens.*




*Bending specimens.*



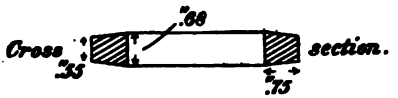

| No. of test. | Description. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation in 8 and 10 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. | Bending tests. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | | | |
| 9538 | 2-inch bolt for 12-inch barbette carriage. | 1.129 | 1.00 | 30,580 | 54,620 | 30.4 | 55.8 | Silky ..... | ".21, ".23, ".23, ".23, .26, .29, .53*, 57*, .28, .21. | Bent cold 180 degrees, and closed down upon itself without fracture. |
| 9653 | 2¼-inch bolt for 12-inch disappearing carriage. | 1.153 | 1.044 | 26,240 | 58,260 | 31.6 | 46.9 | .....do ..... | ".21, ".25, ".29, "49*, ".55*, ".29, .24, .21. | Bent cold 180 degrees, and closed down upon itself without fracture on the tension side. |

*PROOF STRESS APPLIED TO PISTON RODS FOR GUN CARRIAGES.*

| Description. | Total length. | Diameters. | | | Tensile stress applied. |
|---|---|---|---|---|---|
| | | Maximum. | Minimum. | Root of thread. | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Pounds.* |
| 8" disappearing carriage | 119.25 | 2.50 | 2.125 | 2.015 | 40,000 |
| 8" disappearing carriage | 172.75 | 3.50 | 3.00 | 2.89 | 90,000 |
| 10" disappearing carriage | 181.50 | 3.50 | 3.00 | 2.87 | 125,000 |
| 12" disappearing carriage | 220.00 | 4.75 | 4.25 | 2.83 | 150,000 |

COMPRESSION TESTS OF HELICAL SPRINGS FOR 7-INCH MORTAR CARRIAGES. MODEL 1895.

Springs branded "A. D. & Co. 6-98. C. S."
Counter recoil springs.




| No. of spring. | Weight. | Exterior diameter. | Diameter of wire. | Height unloaded. | Load when compressed to height of 6 inches. | Closed down. | | Load when returned to height of 6 inches. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Load. | Height. | |
| | *Lbs. Oz.* | *Inches.* | *Inch.* | *Inches.* | *Pounds.* | *Pounds.* | *Inches.* | *Pounds.* |
| 1 | 8 14¼ | 4.50 | .68 × .75 | 6.90 | 1,422 | 4,300 | 4.15 | 1,097 |
| 2 | 8 13¾ | 4.52 | .68 × .75 | 7.02 | 1,452 | 4,300 | 4.14 | 1,028 |
| 3 | 9 0 | 4.55 | .68 × .75 | 6.97 | 1,446 | 4,500 | 4.19 | 1,216 |
| 4 | 8 14 | 4.51 | .68 × .75 | 7.03 | 1,476 | 4,600 | 4.19 | 1,090 |
| 5 | 8 14¼ | 4.50 | .68 × .75 | 6.98 | 1,443 | 4,350 | 4.18 | 1,110 |
| 6 | 8 13¼ | 4.53 | .68 × .75 | 6.99 | 1,405 | 4,400 | 4.13 | 1,150 |
| 7 | 8 9¾ | 4.53 | .68 × .75 | 6.98 | 1,380 | 4,400 | 4.06 | 1,000 |
| 8 | 8 11¼ | 4.51 | .68 × .74 | 6.99 | 1,344 | 4,600 | 4.19 | 1,002 |
| 9 | 8 14¼ | 4.53 | .68 × .75 | 7.02 | 1,590 | 4,600 | 4.13 | 1,142 |
| 10 | 8 15¼ | 4.54 | .68 × .75 | 7.00 | 1,575 | 4,700 | 4.12 | 1,240 |

The tenth spring was closed down and so remained for a period of 16 hours, at the end of which time the load sustained was 1,112 pounds when returned to a height of 6 inches.

The spring was further loaded 100 times, being closed to a height of 4¼" and released to a height of 6" between each loading.

Load sustained when 4¼" high at one hundredth loading, 4,062 pounds.

Load sustained when 6" high at end of one hundredth loading, 1,095 pounds.

# INTERNAL STRAINS

IN

# GUN FORGINGS.

## INTERNAL STRAINS IN GUN FORGINGS.

Internal strains were introduced by heating the forgings and cooling the same rapidly by quenching from the bore.

The principal series of determinations was made upon metal from the tubes of 5″ R. F. guns.

The initial temperatures of the tubes at the time of quenching, with the rate of flow of the water through the bore at the time of quenching, is given in the following table, together with the initial stresses of compression next the bore at both the breech and muzzle ends of the forging.

The temperature of the water used was 53° to 55° F.

| No. of tube. | Temperature. | Rate of flow of water per minute. | Compressive stress next the bore per square inch. | | Remarks. |
|---|---|---|---|---|---|
| | | | Breech end. | Muzzle end. | |
| | °F. | *Gallons.* | *Pounds.* | *Pounds.* | |
| 5589 C | 975 | 150 | 38,500 | 36,200 | |
| 11226 $B_1$ | 975 | 150 | 31,900 | 27,200 | |
| 11226 $B_1$ | 850 | 150 | 28,100 | 30,800 | Second treatment. |
| 11226 $B_2$ | 975 | 150 | 29,000 | 26,400 | |
| 11226 $B_2$ | 850 | 150 | 30,000 | 28,300 | Do. |
| 11249 $B_1$ | 850 | 120 | 34,200 | 26,000 | |
| 11249 $B_1$ | 850 B<br>925 M | 135 | 35,200 | 32,700 | Do. |
| 11249 $B_2$ | 850 | 120 | 32,800 | 28,300 | |
| 11272 $B_1$ | 850 | 120 | 32,000 | 22,000 | |
| 11272 $B_2$ | 850 | 120 | 26,300 | 15,100 | |
| 11272 $B_2$ | 1,000 | ..... | 5,500 | ..... | Annealed. |
| 11272 $B_3$ | 800 B<br>925 M | 135 | 19,600 | 20,800 | |
| 11272 $B_4$ | 825 M<br>950 B | 135 | 40,100 | 39,700 | Second treatment. |
| 11837 $B_1$ | 850 B<br>875 M | 120 | 33,700 | 29,600 | |

Further inquiry into the state of internal strains under different conditions were made upon the surplus metal from the ends of a 3″ and a 5″ gun, and also from the chase of a 5″ burst gun.

Observations on the surplus metal from the 3″ gun began with measurements on a section 10″.3 long from the breech end of the forging.

Upon detaching a slice ½″ long from the end of this section the slice as a whole contracted in diameter, a result attributed to the relief of longitudinal strains, compression at the bore, and tension along the exterior surface, which caused the section while intact to assume a bell-mouthed shape at the ends.

It was shown subsequently, after the several concentric rings were detached, that the stress of compression at the bore was 4,500 pounds per square inch when the section was intact, but reached 43,800 pounds per square inch in the ½″ slice.

The rearrangement of strains is further shown when rings 1 and 4 were detached from the ½″ slice, leaving rings 2 and 3 still in the slice. The latter rings were then strained corresponding to stresses of 34,600 pounds compression and 10,900 pounds tension, respectively.

Another series of observations on the remaining metal of the section, which was now 9½″ long, gave results similar to those first obtained.

In this experiment rings 1 and 4 were detached, leaving rings 2 and 3 with the intervening metal attached to the end of the section. This was followed by detaching the sides of the latter rings from the adjacent metal and finally detaching the rings altogether from the section.

At each stage there was a change in the state of the internal strains.

The internal strains were practically eliminated in a slice which was annealed by heating to a full red and slowly cooled.

Observations on the surplus metal from the muzzle end of this forging further shows the influence of associated metal in modifying the internal strains present.

The examination of the surplus metal from a 5″ gun tube began while the metal was attached to the ends of the tube.

There was 3¼″ surplus length at the breech end and 5⅞″ at the muzzle end.

When the section from the breech end was cut off, the strains released at the bore were represented by a tensile stress of 12,990 pounds per square inch at a distance of ½″ from the outer end of the section, and a stress of 8,660 pounds per square inch compression at a distance of 3″ from the same end; that is, the outer end of the section contracted in diameter and the inner end expanded upon being detached from the tube.

The new end of the tube, formed upon the removal of the 3¼″ section, expanded at the bore an amount represented by a stress of 21,030 pounds per square inch.

In the subsequent states the measurements at the bore showed the strains and corresponding stresses recorded in the following tables and also shown in the diagram given below.

Bore diameters one-half inch from end (face A–B) and stresses corresponding to the strains released.

AT ONE-HALF INCH POINTS.

| State of experimental section. | Mean diameter. | Strain. | Stress per square inch. |
|---|---|---|---|
| | *Inches.* | *Inch.* | *Pounds.* |
| Tube intact | 4.8497 | .00335 | 20,710 compression. |
| 3¼″ section detached: | | | |
| Watervliet measurements | 4.8476 | .00545 | 33,690 compression. |
| Watertown measurements | 4.8477 | .00535 | 33,070 compression. |
| 3¼″ section faced off to 2″.97 | 4.84795 | .0051 | 31,580 compression. |
| ½″ slice detached | 4.8473 | .00575 | 35,540 compression. |
| Inside ring of ½″ slice taken out | 4.85305 | 0. | 0 |

At about the middle of the length of the 3¼″ section, or 1½″ from the end of the tube, the results with the bore diameters were as follows:

AT 1½ INCH POINTS.

| State of experimental section. | Mean diameter. | Strain. | Stress per square inch. |
|---|---|---|---|
| | *Inches.* | *Inch.* | *Pounds.* |
| Tube intact | 4.8522 | .0055 | 33,970 compression. |
| 3¼″ section detached | 4.85115 | .00655 | 40,450 compression. |
| 3¼″ section faced off to 2″.97 | 4.85125 | .00645 | 39,830 compression. |
| 3¼″ section reduced to 2″.06 long, by slice ½ long from face A–B removed | 4.8521 | .0056 | 34,580 compression. |
| On piece 1″.14, faces A–B and $A_1$–$B_1$ removed | 4.85195 | .00575 | 35,510 compression. |
| Inside ring detached | 4.8577 | 0. | 0 |

Near face $A_1$–$B_1$, or 3″ from the end of the forging, the results with the bore diameters were as follows:

AT 3-INCH POINTS.

| State of experimental section. | Mean diameter. | Strain. | Stress per square inch. |
|---|---|---|---|
| | *Inches.* | *Inch.* | *Pounds.* |
| Tube intact | 4.8518 | .00625 | 38,600 compression. |
| 3¼″ section detached: | | | |
| Watervliet | 4.8532 | .00485 | 29,950 compression. |
| Watertown | 4.85335 | .0047 | 29,020 compression. |
| 3¼″ section faced off to 2″.97 | 4.85325 | .0048 | 29,640 compression. |
| ¼″ slice face A–B removed; section now 2″.06 long. | 4.85325 | .0048 | 29,640 compression. |
| On ¼″ slice detached | 4.85305 | .0050 | 30,880 compression. |
| Inside ring, face $A_1$–$B_1$ | 4.85805 | 0. | 0 |

From the initial and final observations on the bore diameters it is shown that the stresses when the tube was intact were:

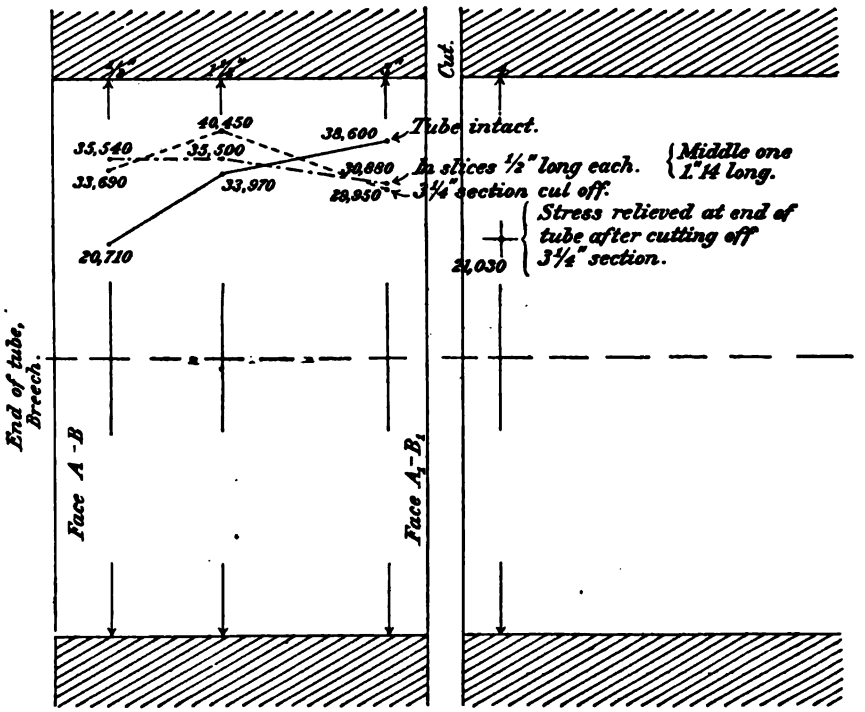
| | Distance from end of tube. | | | Stress. |
|---|---|---|---|---|
| | ¼ inch. | 1¼ inches. | 3 inches. | |
| Tube intact | 20,710 | 33,970 | 38,600 | Compression. |

And in the state of slices ½″ long the stresses were:

| | Distance from end of tube. | | | Stress. |
|---|---|---|---|---|
| | ¼ inch. | 1¼ inches. | 3 inches. | |
| ½″ slices | 35,540 | a 35,510 | 30,880 | Compression. |

a Slice 1″.14 long.

*Sketch showing the stresses at different states of the metal.*




The details of the tests show the changes in strains which occurred on the two faces of the section and in the concentric rings as different slices and rings were successively detached.

At the muzzle end the bore was eccentric with the exterior surface of the rough turned forging, on one side the metal having a thickness of 1".617, and on the other side 2".153. This eccentricity, disturbing the symmetry of the cross-sectional form, very materially modified the disposition of the internal strains found in the $5\frac{7}{8}$" section.

When this section was cut off the end of the tube expanded, corresponding to a stress of 12,680 pounds per square inch at the bore.

Upon turning off the eccentric metal from the $5\frac{7}{8}$" section, reducing the exterior diameter to 8".075, the effect on the diameters at the bore was as follows:

| Distance from end of original forging. | Diameters. | |
|---|---|---|
| | A. Expanded. | B. Contracted. |
| *Inches.* | *Inch.* | *Inch.* |
| ¼ | .0011 | .0004 |
| 1¼ | .0011 | .0008 |
| 3¼ | .0013 | .0002 |
| 5¼ | .0013 | 0. |

The total changes at the bore, from the state of the metal in the tube to the final state of detached rings, were:

| Distance from end of original forging. | Diameters. | |
|---|---|---|
| | A. | B. |
| *Inches.* | *Inch.* | *Inch.* |
| ¼ | +.0071 | −.0025 |
| 1¼ | +.0067 | +.0027 |
| 3¼ | +.0074 | +.0031 |
| 5¼ | +.0083 | +.0023 |

Diameter A passed through the places of maximum and minimum thickness.

The metal in the chase of the 5″ burst gun was examined along intact parts of the tube.

This was a neutral tube, i. e., one not having been treated for the purpose of introducing therein internal strains at the time of the manufacture of the gun.

The examination of rings ″.15 thick was followed by observations upon the behavior of thinner rings next the bore, and finally cutting apart radially these several rings.

The rings next the bore when cut apart radially closed in at the ends as shown in the following table;

| Distance from muzzle. | Thickness of rings. | Ends closed in on a chord of 1″. |
|---|---|---|
| *Inches.* | *Inch.* | *Inch.* |
| 4 | .15 | .23 |
| 60 | .15 | .34 |
| 96 | .15 | .44 |
| 132 | .15 | .23 |
| 60 | .10 | .625 |
| 96 | .10 | .55 |
| 132 | .10 | .36 |

A ring ″.0535 thick taken 4″ from the muzzle closed in, the ends overlapping a distance of 1″.30.

The ″.15 rings from the bore, when detached from their slices, contracted in four cases, showing internal strains of tension existed in the gun, and in one case expanded, showing compression strains.

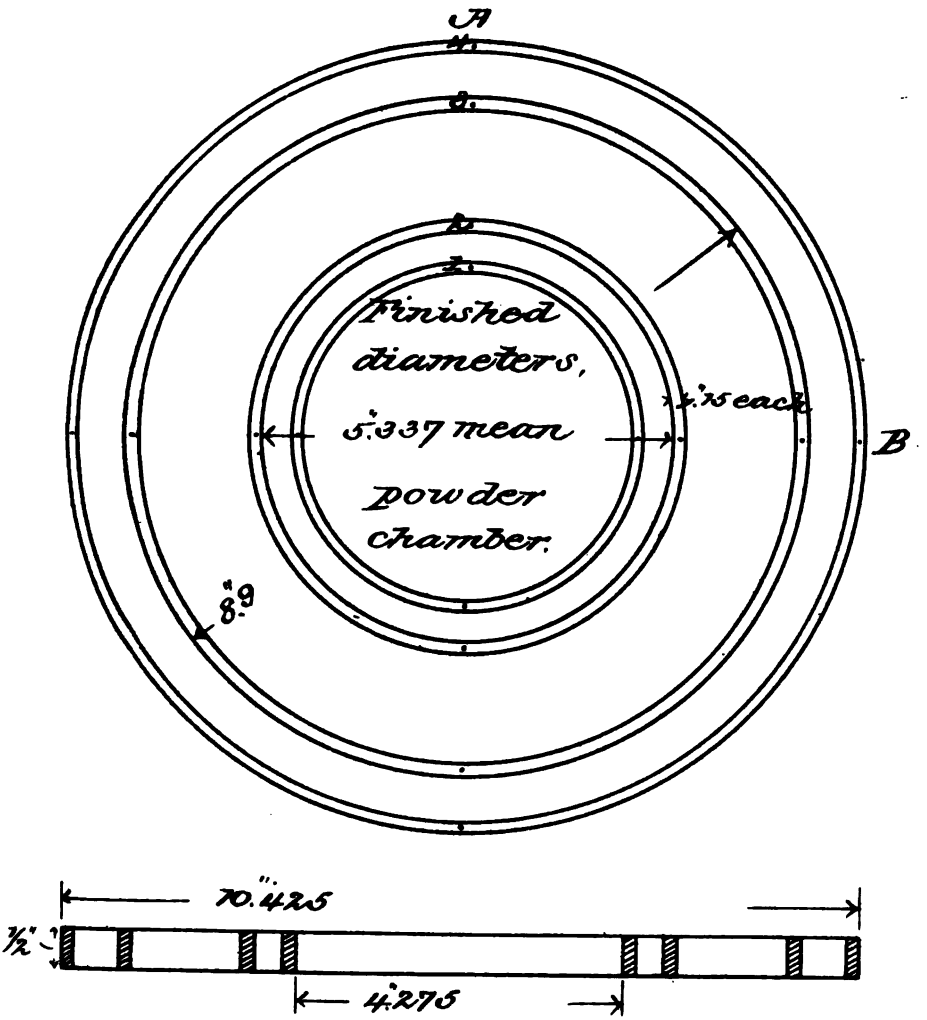
The behavior of the rings when cut apart radially indicated the presence of residual strains in these rings not released upon detaching from the slices, and showing internal strains of tension of considerable intensity at the immediate surface of the bore.

# INTERNAL STRAINS

IN

# 5-INCH R. F. GUN TUBES.

# 5-inch R.F. Gun Tube.
# Marks, "8589 C, 5 R.F., 2 T."
# Breech Slice.



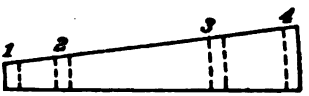
## No. 8589 C.

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

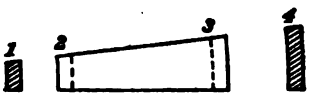
SLICE INTACT.

Interior diameter of slice, 4″.275. Exterior diameter, 10″.425.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.4408 | ..... | .0057 | ..... | 38,500 |
| 2 | 5.4929 | ..... | .00375 | ..... | 20,500 |
| 3 | 8.75315 | .0040 | ..... | 13,700 | ..... |
| 4 | 10.27925 | .0089 | ..... | 26,000 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.34. Exterior diameter, 8″.9.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4465 | ..... | ..... | ..... | ..... |
| 2 | 5.4938 | ..... | .00285 | ..... | 15,600 |
| 3 | 8.75235 | .0032 | ..... | 11,000 | ..... |
| 4 detached | 10.27035 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.49665 | ..... | ..... | ..... | ..... |
| 3 detached | 8.74915 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.275. Exterior diameter, 10″.425.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4394 | 4.4422 | 4.4408 |
| 2 | 5.4963 | 5.4895 | 5.4929 |
| 3 | 8.7547 | 8.7516 | 8.75315 |
| 4 | 10.2774 | 10.2811 | 10.27925 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.34. Exterior diameter, 8″.9.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4449 | 4.4481 | 4.4465 |
| 2 | 5.4978 | 5.4908 | 5.4988 |
| 3 | 8.7540 | 8.7507 | 8.75235 |
| 4 detached | 10.2649 | 10.2758 | 10.27035 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.5000 | 5.4983 | 5.49665 |
| 3 detached | 8.7508 | 8.7475 | 8.74915 |

Breech strains released:

| Rings. | Diameter. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | +.0055 | +.0059 | +.0057 |
| 2 in slice | +.0010 | +.0008 | +.0009 |
| 3 in slice | —.0007 | —.0009 | —.0008 |
| 4 detached | —.0125 | —.0053 | —.0089 |

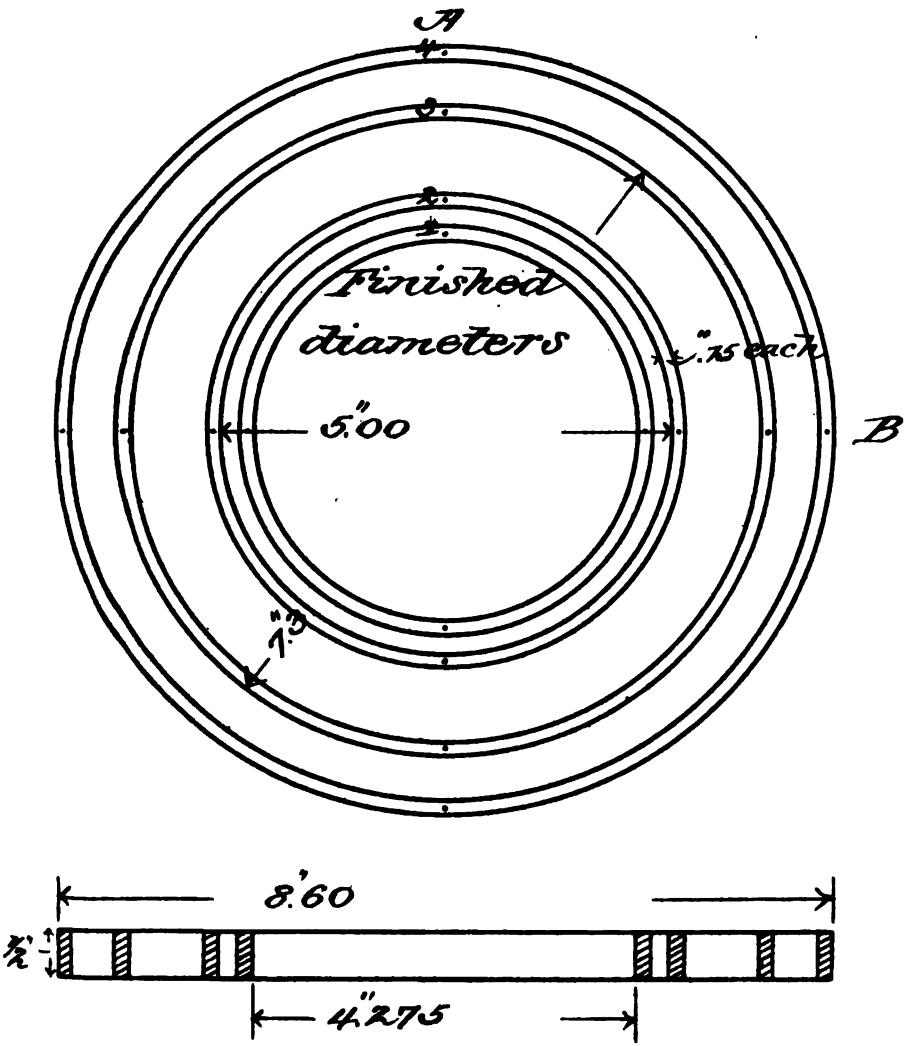
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0027 | +.0030 | +.00285 |
| 3 detached | —.0032 | —.0032 | —.0032 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0037 | +.0038 | +.00375 |
| 3 detached | —.0039 | —.0041 | —.0040 |

# 5-inch R F Gun Tube.
# Marks. "8589 C, 5 R F, 2 T."
# Muzzle Slice



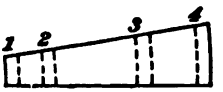
No. 8589 C.

## MUZZLE SLICE.

State of internal strains and stresses at different phases of the slice.

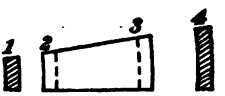
### SLICE INTACT.

Interior diameter of slice, 4″.275. Exterior diameter, 8″.60.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.4366 | ..... | .00585 | ..... | 36,200 |
| 2 | 5.15085 | ..... | .00205 | ..... | 11,900 |
| 3 | 7.1593 | .00285 | ..... | 11,900 | ..... |
| 4 | 8.4372 | .0042 | ..... | 14,900 | ..... |

Rings 1 and 4 detached, rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.44195 | ..... | ..... | ..... | ..... |
| 2 | 5.1503 | ..... | .0026 | ..... | 15,100 |
| 3 | 7.1585 | .00205 | ..... | 8,500 | ..... |
| 4 detached | 8.4330 | ..... | ..... | ..... | ..... |

### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.1529 | ..... | ..... | ..... | ..... |
| 3 detached | 7.15645 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.275. Exterior diameter, 8″.60.
Original diameter of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4348 | 4.4384 | 4.4366 |
| 2 | 5.1501 | 5.1516 | 5.15085 |
| 3 | 7.1586 | 7.1600 | 7.1593 |
| 4 | 8.4430 | 8.4314 | 8.4372 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4414 | 4.4425 | 4.44195 |
| 2 | 5.1495 | 5.1511 | 5.1503 |
| 3 | 7.1575 | 7.1595 | 7.1585 |
| 4 detached | 8.4329 | 8.4331 | 8.4330 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1521 | 5.1537 | 5.1529 |
| 3 detached | 7.1569 | 7.1570 | 7.15645 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | +.0066 | +.0041 | +.00535 |
| 2 in slice | −.0006 | −.0005 | −.00055 |
| 3 in slice | −.0011 | −.0005 | −.0008 |
| 4 detached | −.0101 | +.0017 | −.0042 |

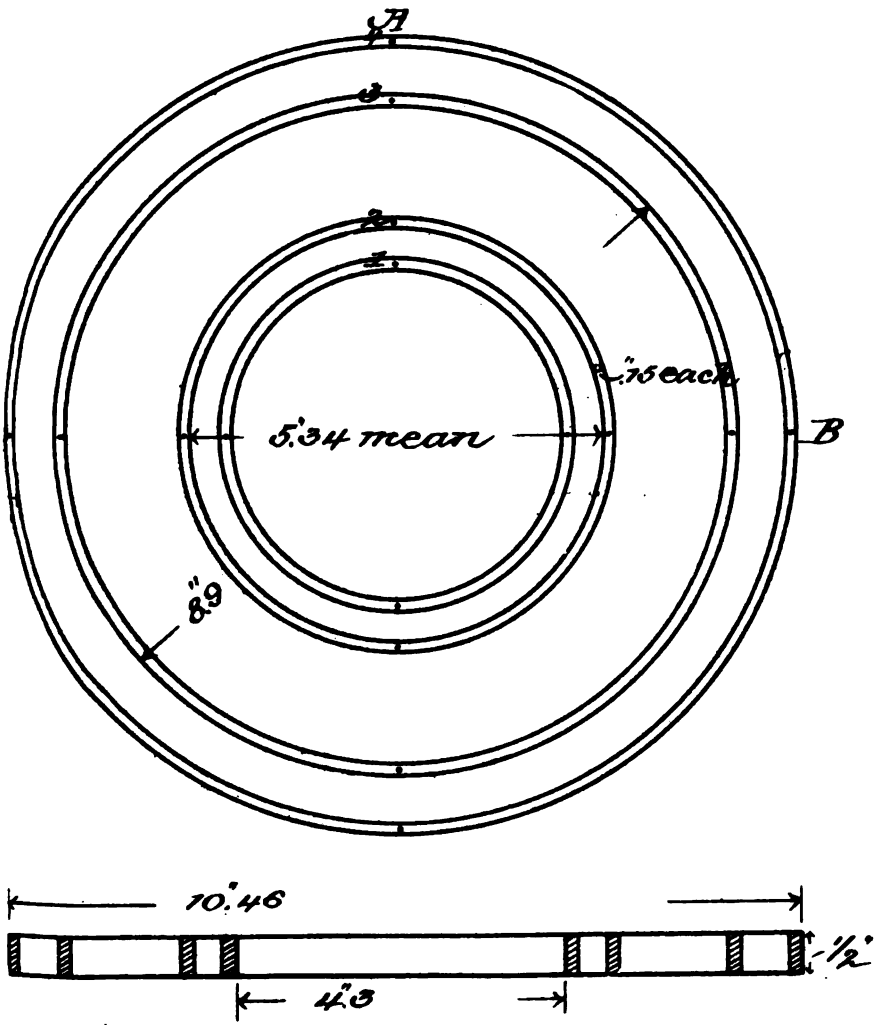
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0026 | +.0026 | +.0026 |
| 3 detached | −.0016 | −.0025 | −.00205 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0020 | +.0021 | +.00205 |
| 3 detached | −.0027 | −.0030 | −.00285 |

# 5-inch R.F. Gun Tube.
## Marks 77,226 B1.
## Breech Slice.



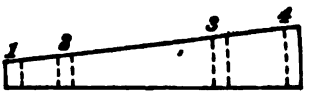
## No. 11226 $B_1$.

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

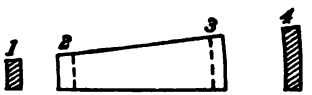
SLICE INTACT.

Interior diameter of slice, 4″.3. Exterior diameter, 10″.46.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.4624 | | .00475 | | 31,900 |
| 2 | 5.4985 | | .00275 | | 15,000 |
| 3 | 8.7533 | .00325 | | 11,100 | |
| 4 | 10.2998 | .00405 | | 11,800 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice 5″.34. Exterior diameter 8″.9.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.46715 | | | | |
| 2 | 5.49715 | | .0041 | | 22,400 |
| 3 | 8.75235 | .0023 | | 7,800 | |
| 4 detached | 10.29525 | | | | |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.50125 | | | | |
| 3 detached | 8.7500 | | | | |

## Breech Slice.

Interior diameter, 4″.3. Exterior diameter, 10″.46.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4639 | 4.4609 | 4.4624 |
| 2 | 5.5019 | 5.4951 | 5.4985 |
| 3 | 8.7522 | 8.7544 | 8.7533 |
| 4 | 10.3028 | 10.2958 | 10.2993 |

Rings 1 and 4 detached, rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4688 | 4.4655 | 4.46715 |
| 2 | 5.5007 | 5.4986 | 5.49715 |
| 3 | 8.7514 | 8.7533 | 8.75235 |
| 4 detached | 10.3009 | 10.2896 | 10.29525 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.5050 | 5.4975 | 5.50125 |
| 3 detached | 8.7492 | 8.7509 | 8.75005 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0049 | +.0046 | +.00475 |
| 2 in slice | −.0012 | −.0015 | −.00135 |
| 3 in slice | −.0008 | −.0011 | −.00095 |
| 4 detached | −.0019 | −.0062 | −.00405 |

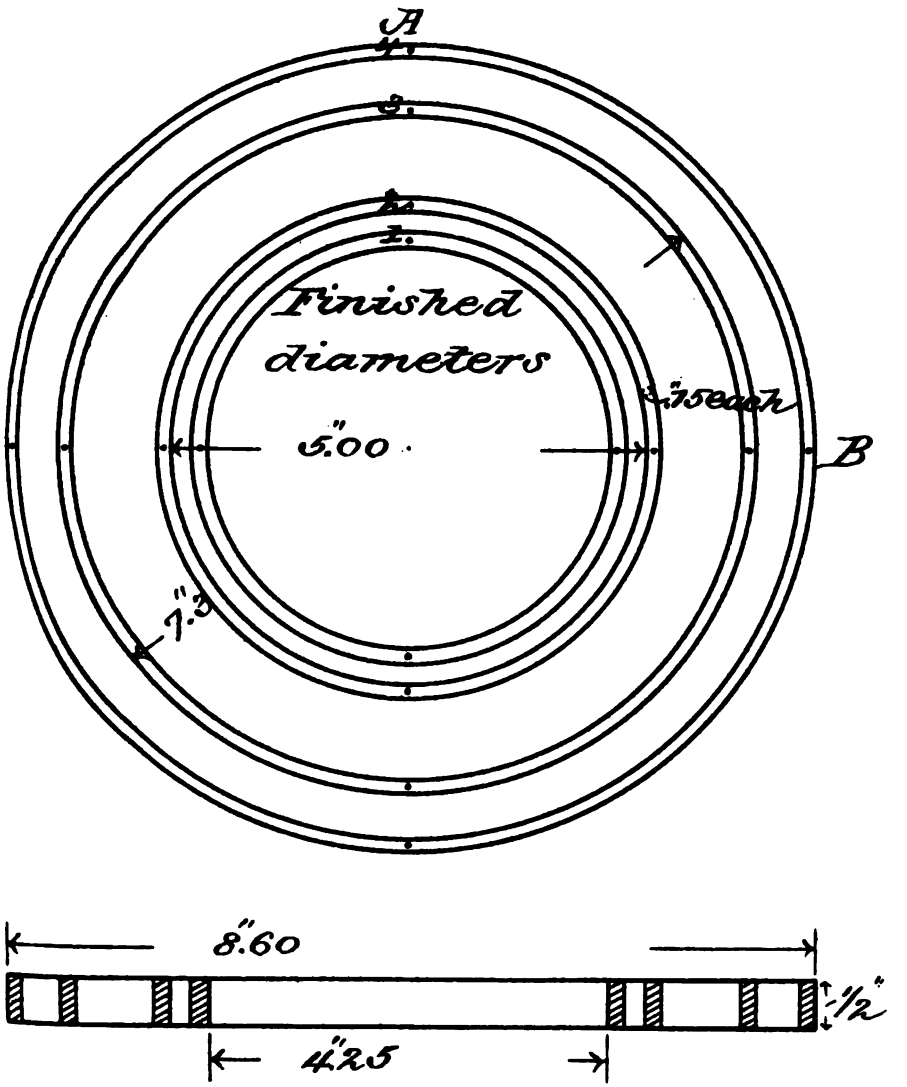
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0043 | +.0039 | +.0041 |
| 3 detached | −.0022 | −.0024 | −.0023 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0031 | +.0024 | +.00275 |
| 3 detached | −.0030 | −.0035 | −.00325 |

# 5-inch R F Gun Tube.
# Marks II, 226 B 1.
# Muzzle Slice.



## No. 11226 $B_1$.

### Muzzle Slice.

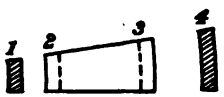
State of internal strains and stresses at different phases of the slice.

SLICE INTACT.

Interior diameter of slice, 4″.25. Exterior diameter, 8″.60.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.4040 | | .0040 | | 27,200 |
| 2 | 5.1464 | | .00415 | | 24,200 |
| 3 | 7.1446 | .00325 | | 13,600 | |
| 4 | 8.4348 | .00315 | | 11,200 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4080 | | | | |
| 2 | 5.14605 | | .0045 | | 26,200 |
| 3 | 7.1445 | .00315 | | 13,200 | |
| 4 detached | 8.43165 | | | | |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.15055 | | | | |
| 3 detached | 7.14135 | | | | |

## Muzzle Slice.

Interior diameter, 4″.25. Exterior diameter, 8″.60.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4042 | 4.4038 | 4.4040 |
| 2 | 5.1476 | 5.1452 | 5.1464 |
| 3 | 7.1452 | 7.1440 | 7.1446 |
| 4 | 8.4339 | 8.4357 | 8.4348 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4080 | 4.4080 | 4.4080 |
| 2 | 5.1472 | 5.1449 | 5.14605 |
| 3 | 7.1451 | 7.1439 | 7.1445 |
| 4 detached | 8.4286 | 8.4347 | 8.43165 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1510 | 5.1501 | 5.15055 |
| 3 detached | 7.1425 | 7.1402 | 7.14135 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0038 | +.0042 | +.0040 |
| 2 in slice | —.0004 | —.0003 | —.00035 |
| 3 in slice | —.0001 | —.0001 | —.0001 |
| 4 detached | —.0053 | —.0010 | —.00315 |

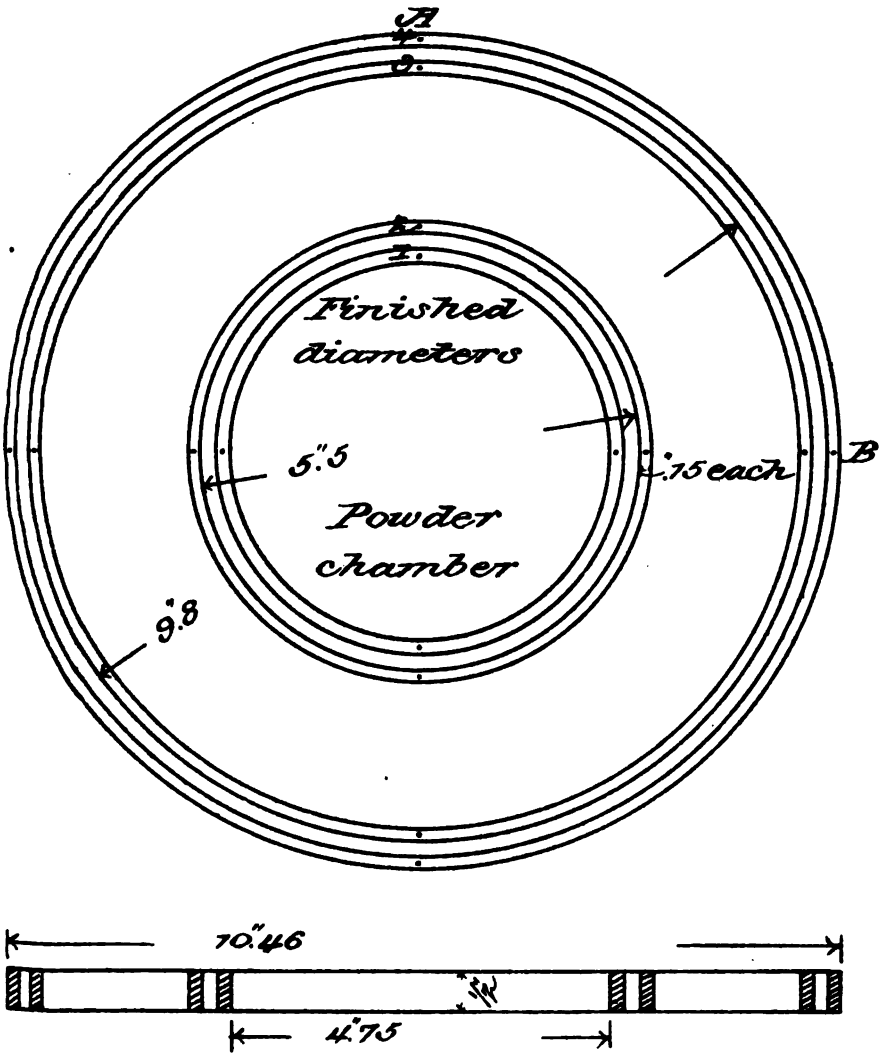
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0038 | +.0052 | +.0045 |
| 3 detached | —.0026 | —.0037 | —.00315 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0034 | +.0049 | +.00415 |
| 3 detached | —.0027 | —.0038 | —.00325 |

# 5-inch R. F. Gun Tube.
## Marks 7726 $B_1$
## Breech Slice.



## No. 11226 $B_1$.

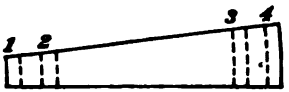
(Second treatment.)

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

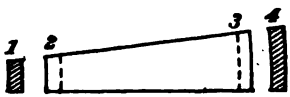
SLICE INTACT.

Interior diameter of slice, 4″.75. Exterior diameter, 10″.46.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.9113 | | .0046 | | 28,100 |
| 2 | 5.6390 | | .0039 | | 20,700 |
| 3 | 9.6444 | .00415 | | 12,900 | |
| 4 | 10.3013 | .00105 | | 3,100 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.5. Exterior diameter, 9″.8.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.9159 | | | | |
| 2 | 5.6377 | | .0052 | | 27,700 |
| 3 | 9.64355 | .0033 | | 10,300 | |
| 4 detached | 10.30025 | | | | |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.6429 | | | | |
| 3 detached | 9.64025 | | | | |

## Breech Slice.

Interior diameter, 4″.75. Exterior diameter, 10″.46.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9106 | 4.9120 | 4.9113 |
| 2 | 5.6385 | 5.6395 | 5.6390 |
| 3 | 9.6483 | 9.6405 | 9.6444 |
| 4 | 10.3040 | 10.2986 | 10.3013 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9151 | 4.9167 | 4.9159 |
| 2 | 5.6371 | 5.6383 | 5.6377 |
| 3 | 9.6472 | 9.6399 | 9.64355 |
| 4 detached | 10.3066 | 10.2919 | 10.3002 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6432 | 5.6426 | 5.6429 |
| 3 detached | 9.6458 | 9.6352 | 9.64025 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0045 | +.0047 | +.0046 |
| 2 in the slice | −.0014 | −.0012 | −.0013 |
| 3 in the slice | −.0011 | −.0006 | −.00085 |
| 4 detached | +.0046 | −.0067 | −.00105 |

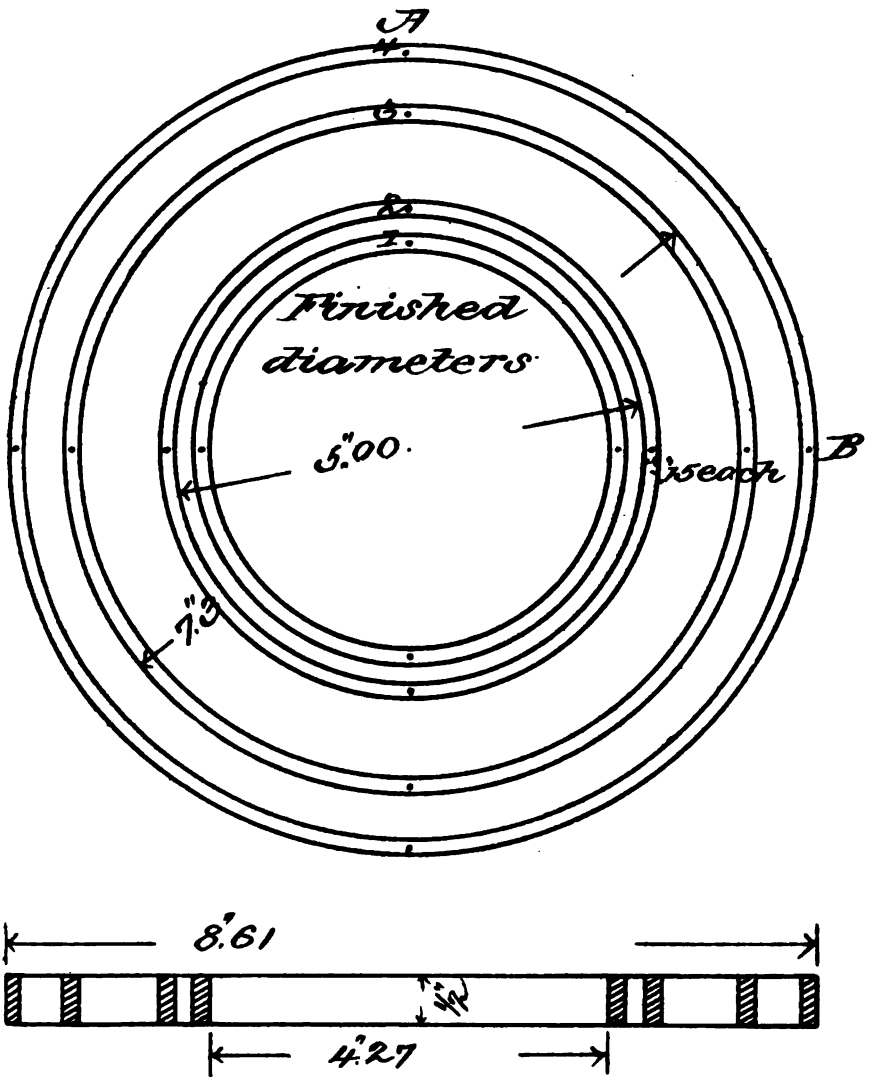
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0061 | +.0043 | +.0052 |
| 3 detached | −.0019 | −.0047 | −.0033 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0047 | +.0031 | +.0039 |
| 3 detached | −.0030 | −.0058 | −.00415 |

5-inch R. F. Gun Tube.
Marks 77226 B1
Muzzle Slice.



## No. 11226 $B_1$.

## (Second treatment.)

## MUZZLE SLICE.

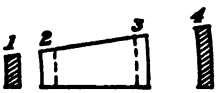
State of internal strains and stresses at different phases of the slice.

### SLICE INTACT.

Interior diameter of slice, 4″.27. Exterior diameter, 8″.61

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.43045 | ..... | .00456 | ..... | 30,800 |
| 2 | 5.1464 | ..... | .00155 | ..... | 9,000 |
| 3 | 7.1342 | .00185 | ..... | 7,800 | ..... |
| 4 | 8.4462 | .00025 | ..... | 900 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4350 | ..... | ..... | ..... | ..... |
| 2 | 5.1455 | ..... | .00245 | ..... | 14,800 |
| 3 | 7.13856 | .0012 | ..... | 5,000 | ..... |
| 4 detached | 8.44595 | ..... | ..... | ..... | ..... |

### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.14795 | ..... | ..... | ..... | ..... |
| 3 detached | 7.13255 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.27. Exterior diameter, 8″.61.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4307 | 4.4302 | 4.43045 |
| 2 | 5.1449 | 5.1479 | 5.1464 |
| 3 | 7.1311 | 7.1373 | 7.1342 |
| 4 | 8.4404 | 8.4520 | 8.4462 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4350 | 4.4350 | 4.4350 |
| 2 | 5.1438 | 5.1472 | 5.1455 |
| 3 | 7.1302 | 7.1369 | 7.13355 |
| 4 detached | 8.4483 | 8.4436 | 8.44595 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1463 | 5.1496 | 5.14795 |
| 3 detached | 7.1284 | 7.1363 | 7.13235 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0043 | +.0048 | +.00455 |
| 2 in the slice | −.0011 | −.0007 | −.0009 |
| 3 in the slice | −.0009 | −.0004 | −.00065 |
| 4 detached | +.0079 | −.0084 | −.00025 |

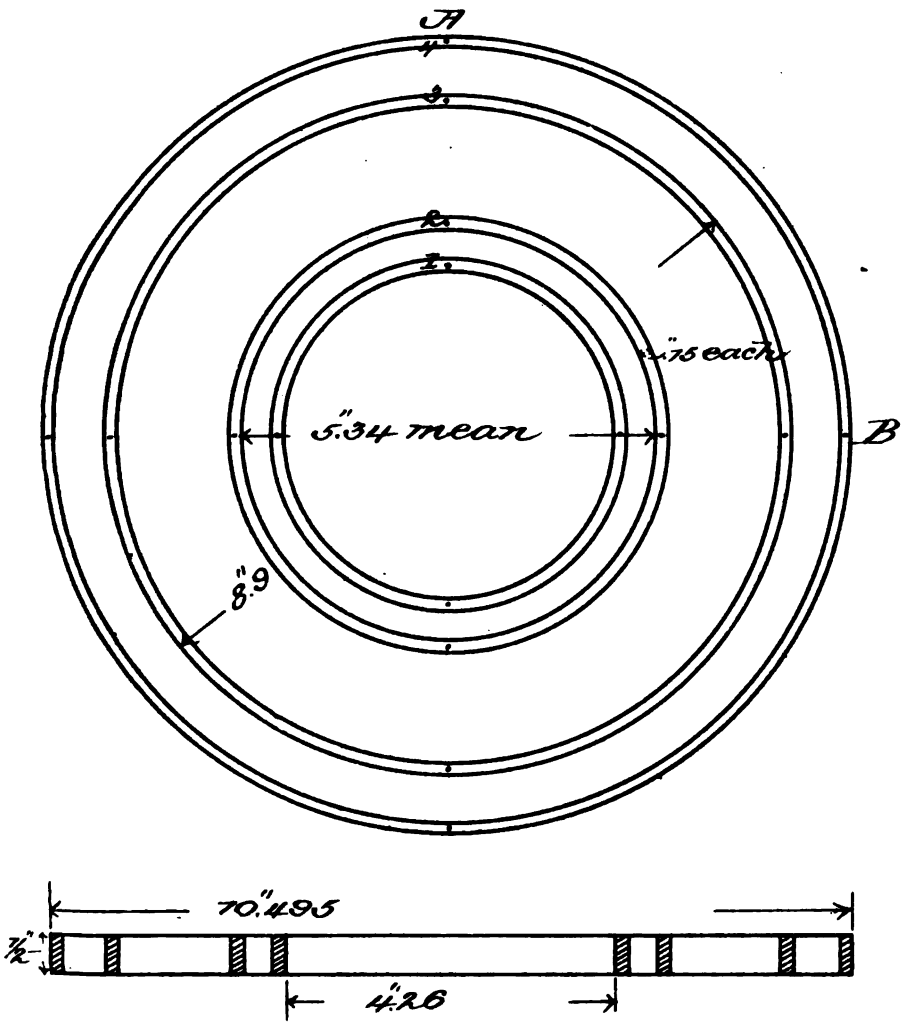
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0025 | +.0024 | +.00245 |
| 3 detached | −.0018 | −.0006 | −.0012 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0014 | +.0017 | +.00155 |
| 3 detached | −.0027 | −.0010 | −.00185 |

5-inch R F Gun Tube.
Marks 11,226 B 2.
Breech Slice



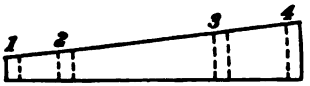
## No. 11226 $B_2$.

## Breech Slice.

State of internal strains and stresses at different phases of the slice.

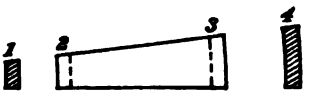
### SLICE INTACT.

Interior diameter of slice, 4″.26. Exterior diameter, 10″.495.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.44035 | | .0043 | | 29,000 |
| 2 | 5.4960 | | .00845 | | 18,800 |
| 3 | 8.7573 | .00456 | | 15,600 | |
| 4 | 10.27385 | .00296 | | 8,600 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.34. Exterior diameter, 8″.9.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.44465 | | | | |
| 2 | 5.49495 | | .0045 | | 24,600 |
| 3 | 8.75685 | .0041 | | 14,000 | |
| 4 detached | 10.2709 | | | | |

### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.49945 | | | | |
| 3 detached | 8.75275 | | | | |

## Breech Slice.

Interior diameter, 4″.26. Exterior diameter, 10″.495.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4408 | 4.4399 | 4.44035 |
| 2 | 5.4989 | 5.4931 | 5.4960 |
| 3 | 8.7526 | 8.7620 | 8.7573 |
| 4 | 10.2677 | 10.2800 | 10.27385 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4462 | 4.4431 | 4.44465 |
| 3 | 5.4981 | 5.4918 | 5.49495 |
| 3 | 8.7523 | 8.7614 | 8.75685 |
| 4 detached | 10.2551 | 10.2867 | 10.2709 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.5012 | 5.4977 | 5.49945 |
| 3 detached | 8.7485 | 8.7570 | 8.75275 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0054 | +.0032 | +.0043 |
| 2 in slice | −.0008 | −.0013 | −.00105 |
| 3 in slice | −.0008 | −.0006 | −.00045 |
| 4 detached | −.0126 | +.0067 | −.00295 |

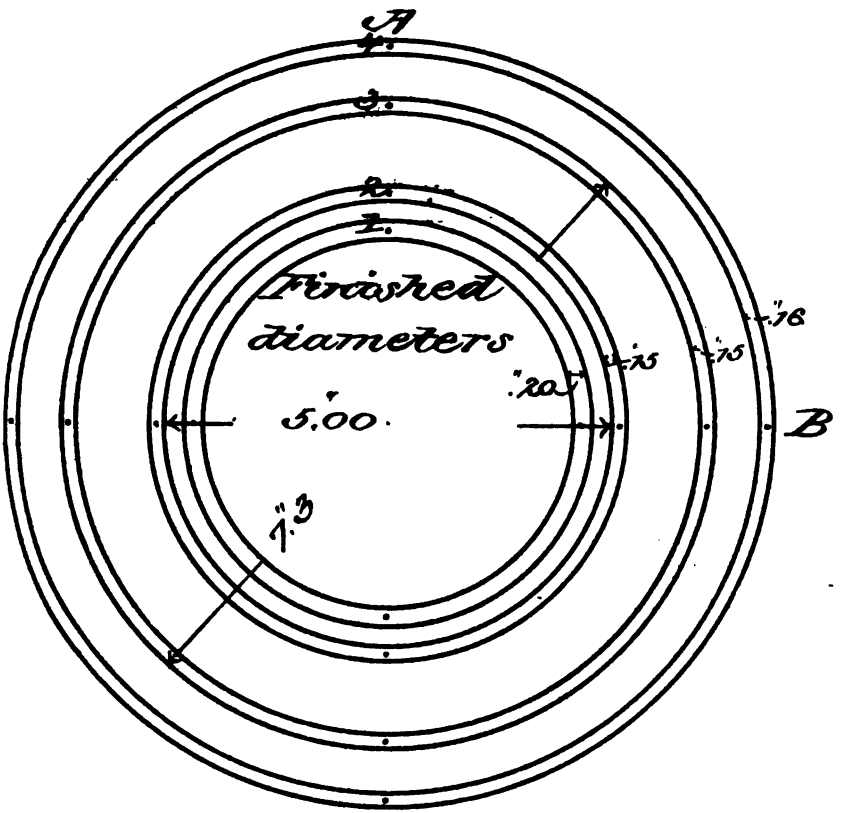
SECOND TO THIRD PHASE.

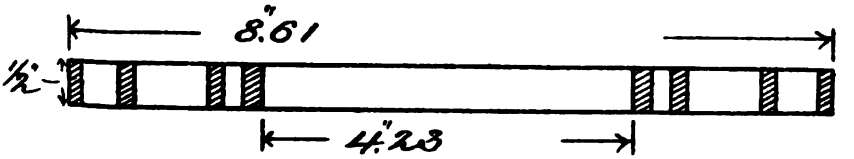
| | | | |
|---|---|---|---|
| 2 detached | +.0031 | +.0059 | +.0045 |
| 3 detached | −.0088 | −.0044 | −.0041 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0023 | +.0046 | +.00345 |
| 3 detached | −.0041 | −.0050 | −.00455 |

# 5-inch R.F. Gun Tube.
# Mark 8, 11,226 B2
# Muzzle Slice



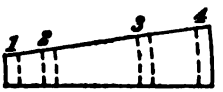
## No. 11226 $B_2$.

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

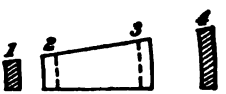
#### SLICE INTACT.

Interior diameter of slice, 4″.23. Exterior diameter, 8″.61.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.4293 | | .0039 | | 26,400 |
| 2 | 5.1492 | | .00235 | | 13,700 |
| 3 | 7.14795 | .00325 | | 13,600 | |
| 4 | 8.45265 | | .0043 | | 15,300 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4332 | | | | |
| 2 | 5.1480 | | .00355 | | 20,700 |
| 3 | 7.1471 | .0024 | | 10,100 | |
| 4 detached | 8.45695 | | | | |

#### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.15155 | | | | |
| 3 detached | 7.1447 | | | | |

## Muzzle Slice.

Interior diameter, 4″.23. Exterior diameter, 8″.61.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4301 | 4.4285 | 4.4293 |
| 2 | 5.1524 | 5.1460 | 5.1492 |
| 3 | 7.1509 | 7.1450 | 7.14795 |
| 4 | 8.4582 | 8.4521 | 8.45265 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4341 | 4.4323 | 4.4332 |
| 2 | 5.1513 | 5.1447 | 5.1480 |
| 3 | 7.1502 | 7.1440 | 7.1471 |
| 4 detached | 8.4507 | 8.4682 | 8.45695 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1556 | 5.1475 | 5.15155 |
| 3 detached | 7.1477 | 7.1417 | 7.1447 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0040 | +.0038 | +.0039 |
| 2 in slice | −.0011 | −.0013 | −.0012 |
| 3 in slice | −.0007 | −.0010 | −.00085 |
| 4 detached | −.0025 | +.0111 | +.0043 |

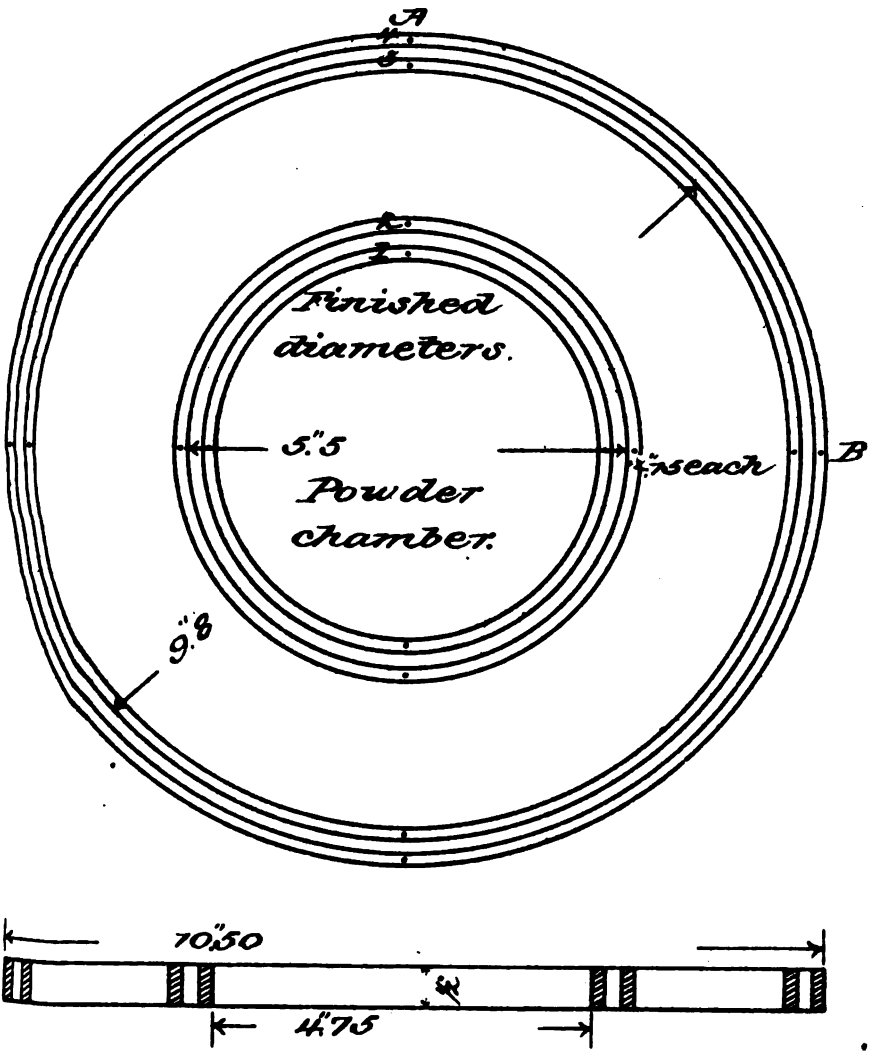
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0043 | +.0028 | +.00355 |
| 3 detached | −.0025 | −.0023 | −.0024 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0032 | +.0015 | +.00235 |
| 3 detached | −.0032 | −.0033 | −.00325 |

5-inch R. F. Gun Tube.
Marks 77226 B2
Breech Slice.



No. 11226 $B_2$.

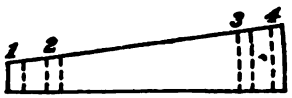
Second treatment.

BREECH SLICE.

State of internal strains and stresses at different phases of the slice.

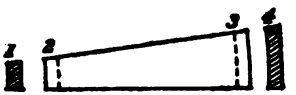
SLICE INTACT.

Interior diameter of slice, 4″.75. Exterior diameter, 10″.50.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.90065 | ..... | .0049 | ..... | 30,000 |
| 2 | 5.6447 | ..... | .00435 | ..... | 23,100 |
| 3 | 9.6408 | .0083 | ..... | 10,300 | ..... |
| 4 | 10.33605 | .00225 | ..... | 6,500 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.5. Exterior diameter, 9″.8.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.90555 | ..... | ..... | ..... | ..... |
| 2 | 5.6434 | ..... | .00565 | ..... | 30,000 |
| 3 | 9.6402 | .0027 | ..... | 8,400 | ..... |
| 4 detached | 10.3338 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.64905 | ..... | ..... | ..... | ..... |
| 3 detached | 9.6375 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.75. Exterior diameter, 10″.50.
Original diameter of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.8992 | 4.9021 | 4.90065 |
| 2 | 5.6434 | 5.6460 | 5.6447 |
| 3 | 9.6440 | 9.6376 | 9.6408 |
| 4 | 10.3355 | 10.3366 | 10.33605 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9044 | 4.9067 | 4.90555 |
| 2 | 5.6420 | 5.6448 | 5.6434 |
| 3 | 9.6432 | 9.6372 | 9.6402 |
| 4 detached | 10.3360 | 10.3316 | 10.3338 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6485 | 5.6496 | 5.64905 |
| 3 detached | 9.6430 | 9.6320 | 9.6375 |

Breech strains released.

| Rings. | Diameters. | | Mean. |
|---|---|---|---|
| | A. | B. | |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0052 | +.0046 | +.0049 |
| 2 in slice | −.0014 | −.0012 | −.0013 |
| 3 in slice | −.0008 | −.0004 | −.0006 |
| 4 detached | +.0005 | −.0050 | −.00225 |

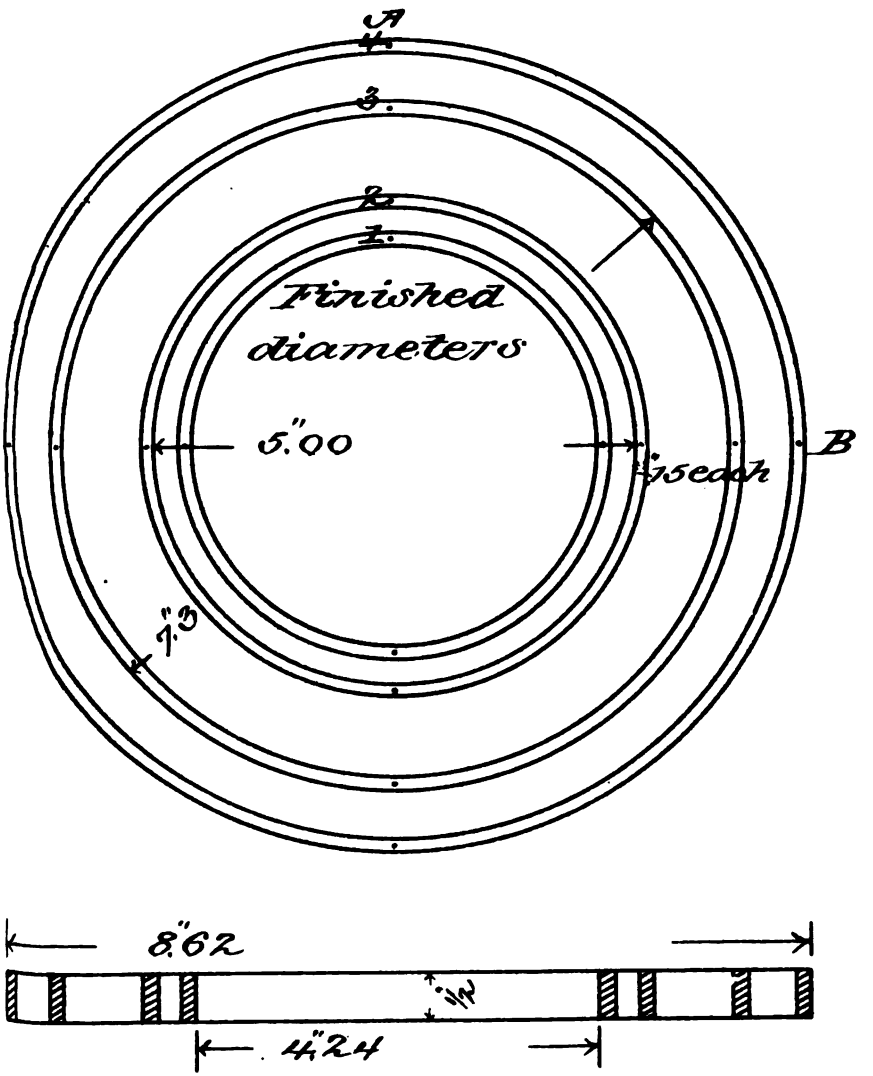
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0065 | +.0048 | +.00565 |
| 3 detached | −.0002 | −.0052 | −.0027 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0051 | +.0036 | +.00435 |
| 3 detached | −.0010 | −.0056 | −.0033 |

# 5-inch R.F. Gun Tube.
## Marks 7 R 26 B 2
## Muzzle Slice.



## No. 11226 $B_2$.

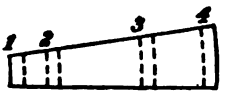
(Second treatment.)

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

SLICE INTACT.

Interior diameter of slice, 4".24. Exterior diameter, 8".62.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.3975 | ..... | .00415 | ..... | 28,300 |
| 2 | 5.14505 | ..... | .0006 | ..... | 3,400 |
| 3 | 7.1304 | .0017 | ..... | 7,100 | ..... |
| 4 | 8.46955 | .0006 | ..... | 2,100 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5".00. Exterior diameter, 7".3.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.40165 | ..... | ..... | ..... | ..... |
| 2 | 5.14435 | ..... | .0013 | ..... | 7,500 |
| 3 | 7.1298 | .0011 | ..... | 4,600 | ..... |
| 4 detached | 8.46895 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.14565 | ..... | ..... | ..... | ..... |
| 3 detached | 7.1287 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.24. Exterior diameter, 8″.62.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3932 | 4.4018 | 4.3975 |
| 2 | 5.1427 | 5.1474 | 5.14505 |
| 3 | 7.1313 | 7.1295 | 7.1304 |
| 4 | 8.4750 | 8.4641 | 8.46955 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.3974 | 4.4059 | 4.40165 |
| 2 | 5.1421 | 5.1466 | 5.14435 |
| 3 | 7.1310 | 7.1286 | 7.1298 |
| 4 detached | 8.4685 | 8.4694 | 8.46895 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1438 | 5.1475 | 5.14565 |
| 3 detached | 7.1297 | 7.1277 | 7.1287 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0042 | +.0041 | +.00415 |
| 2 in slice | −.0006 | −.0008 | −.0007 |
| 3 in slice | −.0008 | −.0009 | −.0006 |
| 4 detached | −.0065 | +.0053 | −.0006 |

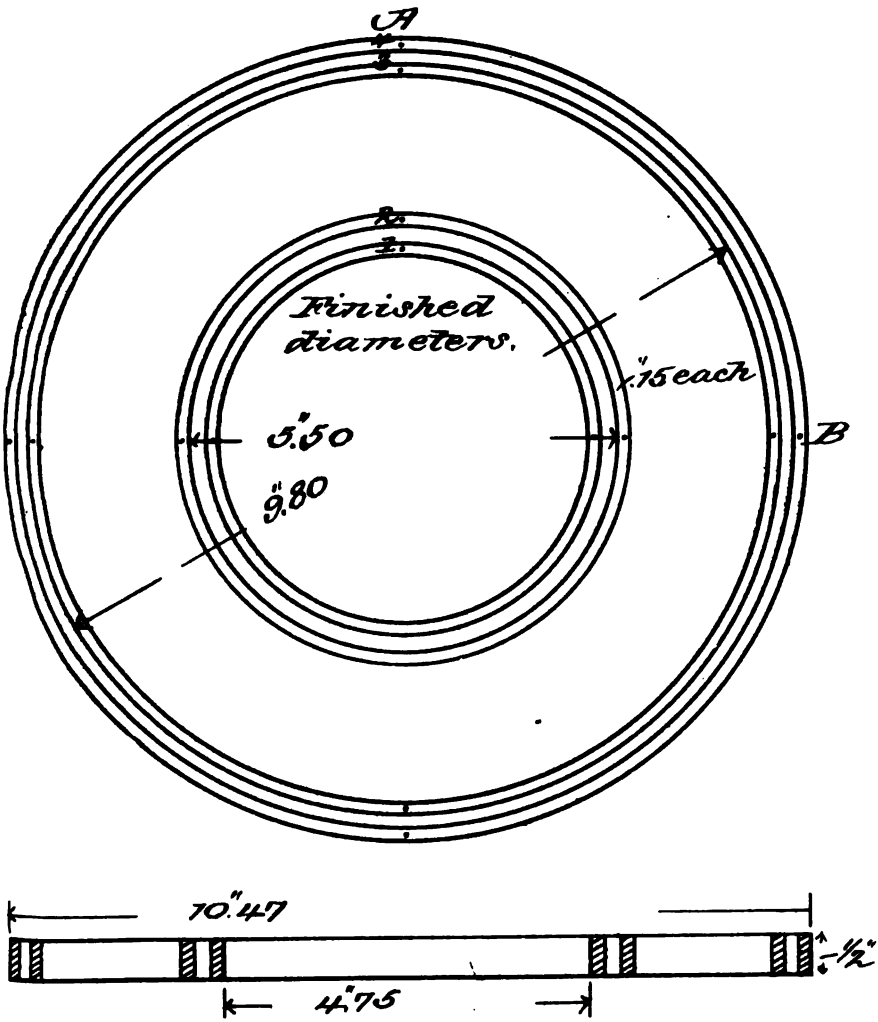
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0017 | +.0009 | +.0013 |
| 3 detached | −.0018 | −.0009 | −.0011 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0011 | +.0001 | +.0006 |
| 3 detached | −.0016 | −.0018 | −.0017 |

6-inch R.F. Gun Tube.
Marks I1249 B1.
Breech Slice.



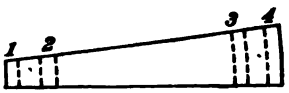
## No. 11249 $B_1$.

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

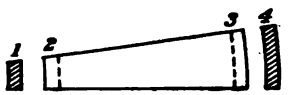
SLICE INTACT.

Interior diameter of slice, 4″.75. Exterior diameter, 10″.47.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.90545 | ..... | .0056 | ..... | 34,200 |
| 2 | 5.65095 | ..... | .0019 | ..... | 10,100 |
| 3 | 9.64305 | .0033 | ..... | 10,300 | ..... |
| 4 | 10.2338 | .00415 | ..... | 12,200 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.50. Exterior diameter, 9″.80.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.91105 | ..... | ..... | ..... | ..... |
| 2 | 5.64945 | ..... | .0034 | ..... | 18,100 |
| 3 | 9.64195 | .0022 | ..... | 6,800 | ..... |
| 4 detached | 10.22965 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.65285 | ..... | ..... | ..... | ..... |
| 3 detached | 9.63975 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.75. Exterior diameter, 10″.47.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9056 | 4.9053 | 4.90545 |
| 2 | 5.6588 | 5.6481 | 5.65095 |
| 3 | 9.6430 | 9.6431 | 9.64305 |
| 4 | 10.2409 | 10.2267 | 10.2338 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9114 | 4.9107 | 4.91105 |
| 2 | 5.6525 | 5.6464 | 5.64945 |
| 3 | 9.6420 | 9.6419 | 9.64195 |
| 4 detached | 10.2416 | 10.2177 | 10.22965 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6551 | 5.6506 | 5.65285 |
| 3 detached | 9.6404 | 9.6391 | 9.63975 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0058 | +.0054 | +.0056 |
| 2 in slice | −.0013 | −.0017 | −.0015 |
| 3 in slice | −.0010 | −.0012 | −.0011 |
| 4 detached | +.0007 | −.0090 | −.00415 |

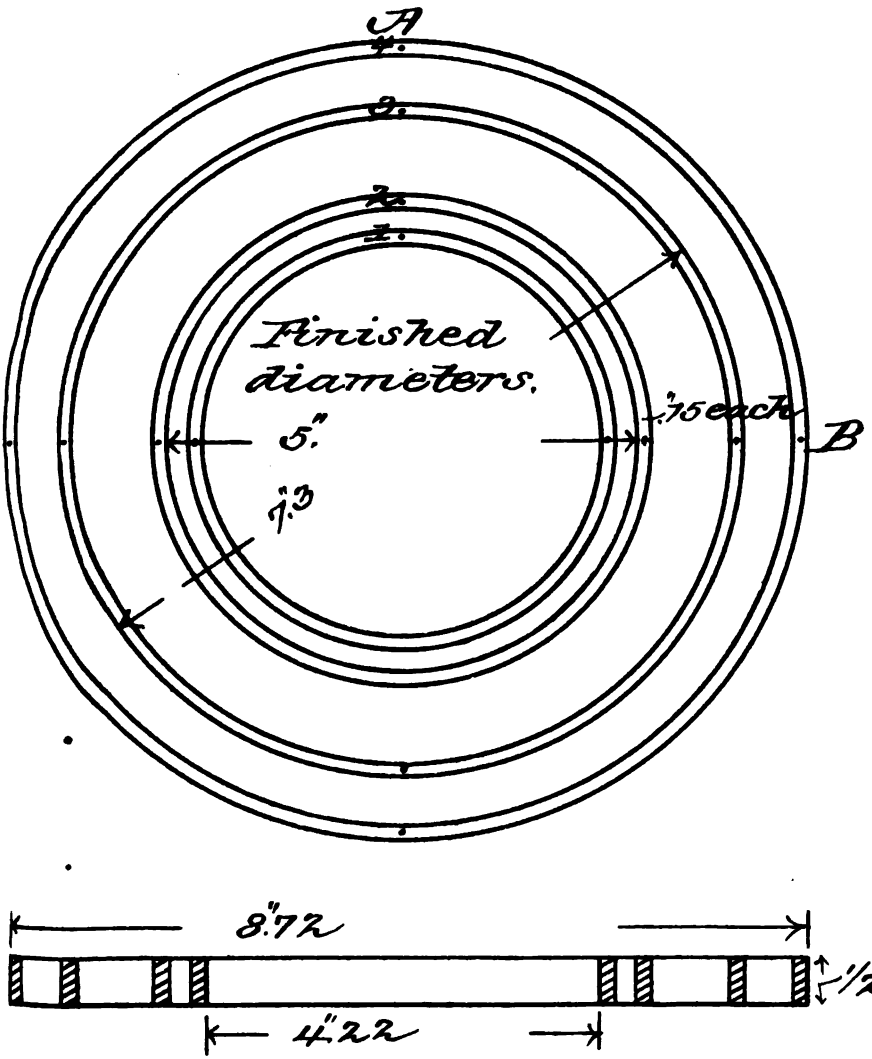
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0026 | +.0042 | +.0034 |
| 3 detached | −.0016 | −.0028 | −.0022 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0018 | +.0025 | +.0019 |
| 3 detached | −.0026 | −.0040 | −.0033 |

5-inch R. F. Gun Tube.
Marks 11248 B1.
Muzzle Slice.



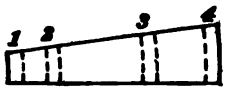
## No. 11249 $B_1$.

### Muzzle Slice.

**State of internal strains and stresses at different phases of the slice.**

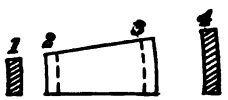
#### SLICE INTACT.

Interior diameter of slice, 4″.22. Exterior diameter, 8″.72.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.37665 | ..... | .0088 | ..... | 26,000 |
| 2 | 5.14505 | ..... | .00015 | ..... | 900 |
| 3 | 7.1547 | .00125 | ..... | 5,200 | ..... |
| 4 | 8.5507 | .00175 | ..... | 6,100 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.38045 | ..... | ..... | ..... | ..... |
| 2 | 5.1440 | ..... | .0012 | ..... | 7,000 |
| 3 | 7.1589 | .00045 | ..... | .1900 | ..... |
| 4 detached | 8.54895 | ..... | ..... | ..... | ..... |

#### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.1452 | ..... | ..... | ..... | ..... |
| 3 detached | 7.15845 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.22. Exterior diameter, 8″.72.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3750 | 4.3783 | 4.37665 |
| 2 | 5.1469 | 5.1432 | 5.14505 |
| 2 | 7.1548 | 7.1546 | 7.1547 |
| 4 | 8.5483 | 8.5531 | 8.5507 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.3789 | 4.3820 | 4.38045 |
| 2 | 5.1459 | 5.1421 | 5.1440 |
| 3 | 7.1542 | 7.1536 | 7.1539 |
| 4 detached | 8.5425 | 8.5554 | 8.54895 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1465 | 5.1439 | 5.1452 |
| 3 detached | 7.1540 | 7.1529 | 7.15345 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0039 | +.0037 | +.0038 |
| 2 in slice | −.0010 | −.0011 | −.00105 |
| 3 in slice | −.0006 | −.0010 | −.0008 |
| 4 detached | −.0058 | +.0028 | −.00175 |

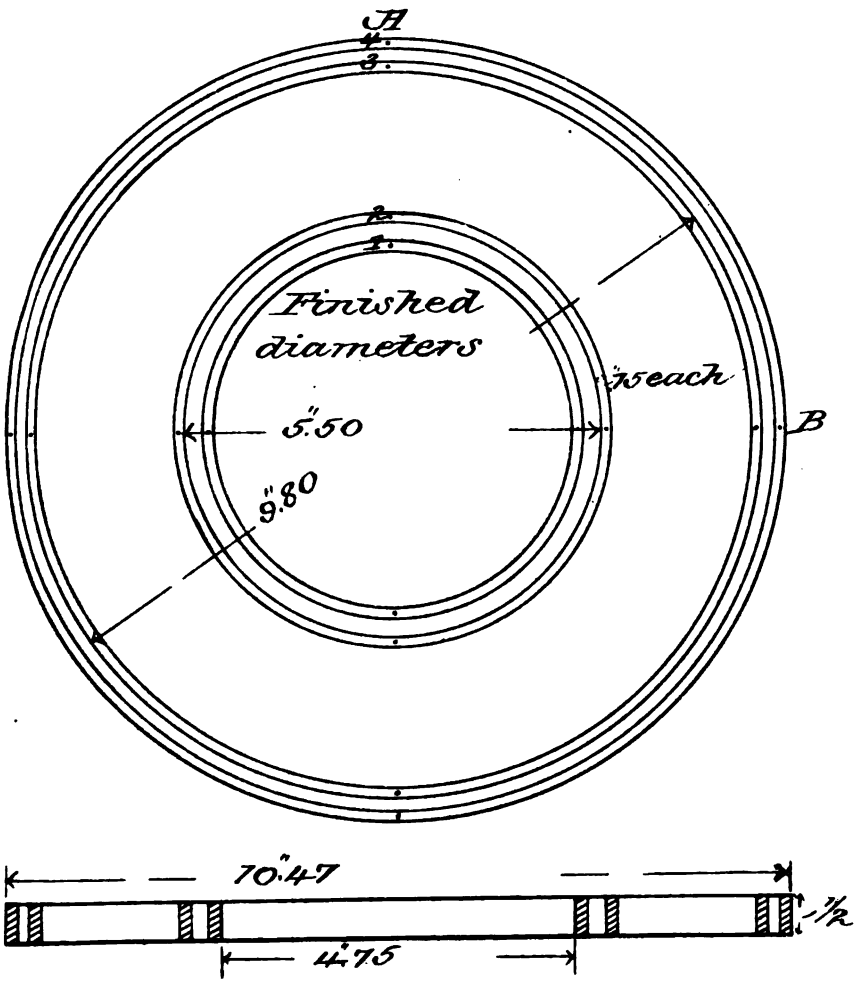
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0006 | +.0018 | +.0012 |
| 3 detached | −.0002 | −.0007 | −.00045 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | −.0004 | +.0007 | +.00015 |
| 3 detached | -.0008 | −.0017 | −.00125 |

5-inch R. F. Gun Tube.
Marks 77249 B1
Breech Slice.



## No. 11249 $B_1$.

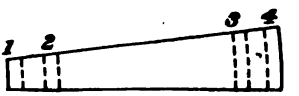
### Second treatment.

### Breech Slice.

**State of internal strains and stresses at different phases of the slice.**

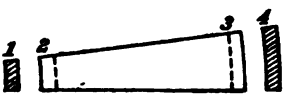
SLICE INTACT.

**Interior diameter of slice, 4″.75. Exterior diameter, 10″.47.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.90585 | ..... | .00575 | ..... | 35,200 |
| 2 | 5.6607 | ..... | .00315 | ..... | 16,700 |
| 3 | 9.6613 | .0084 | ..... | 10,600 | ..... |
| 4 | 10.2644 | .00275 | ..... | 8,000 | ..... |

**Rings 1 and 4 detached; rings 2 and 3 in the slice.**
**Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.9116 | ..... | ..... | ..... | ..... |
| 2 | 5.65895 | ..... | .0049 | ..... | 26,000 |
| 3 | 9.6602 | .0023 | ..... | 7,100 | ..... |
| 4 detached | 10.26165 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.66385 | | | | |
| 3 detached | 9.6579 | | | | |

## Breech Slice.

Interior diameter, 4″.75. Exterior diameter, 10″.47.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9055 | 4.9062 | 4.90585 |
| 2 | 5.6632 | 5.6582 | 5.6607 |
| 3 | 9.6621 | 9.6605 | 9.6613 |
| 4 | 10.2628 | 10.2660 | 10.2644 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9109 | 4.9123 | 4.9116 |
| 2 | 5.6611 | 5.6568 | 5.65895 |
| 3 | 9.6610 | 9.6594 | 9.6602 |
| 4 detached | 10.2670 | 10.2563 | 10.26165 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6667 | 5.6610 | 5.66385 |
| 3 detached | 9.6582 | 9.6576 | 9.6579 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0054 | +.0061 | +.00575 |
| 2 in slice | −.0021 | −.0014 | −.00175 |
| 3 in slice | −.0011 | −.0011 | −.0011 |
| 4 detached | +.0042 | −.0097 | −.00275 |

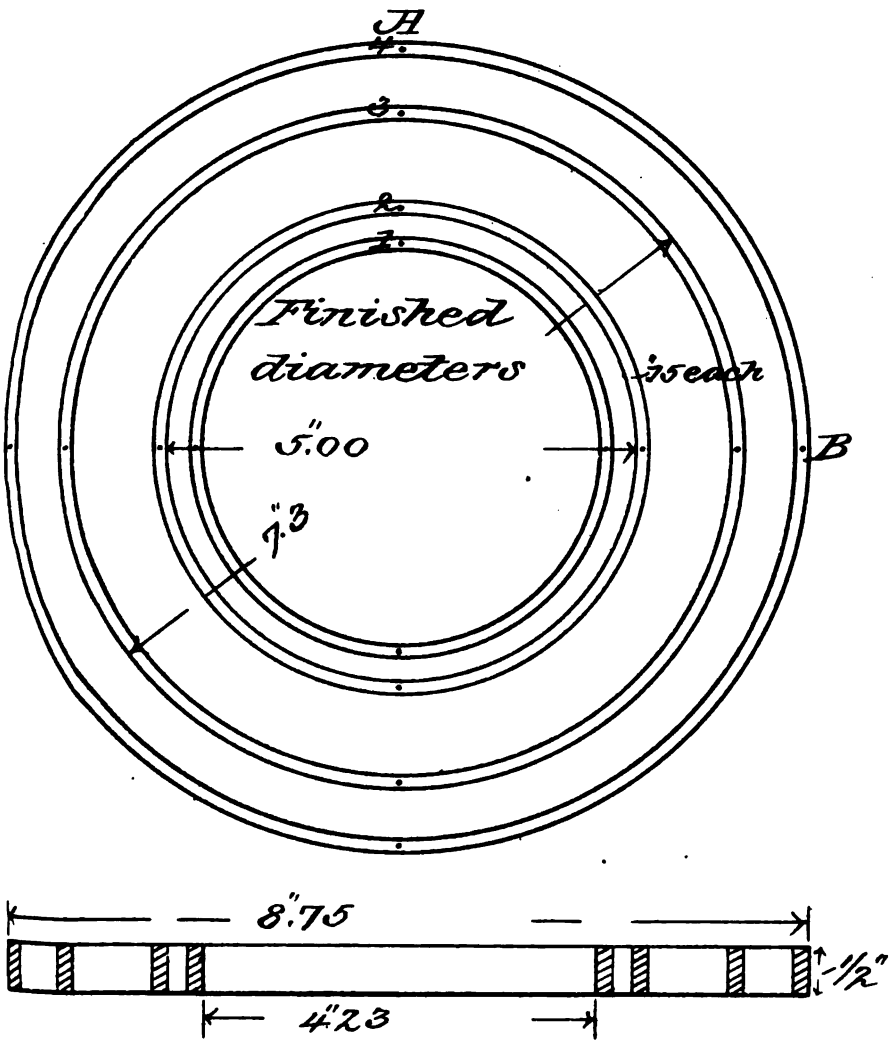
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0056 | +.0042 | +.0049 |
| 3 detached | −.0028 | −.0018 | −.0023 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0035 | +.0028 | +.00315 |
| 3 detached | −.0039 | −.0029 | −.0034 |

5-inch R. F. Gun Tube.
Marks 77249 $B_1$
Muzzle Slice.



## No. 11249 $B_1$.

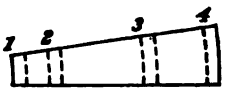
### Second treatment.

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

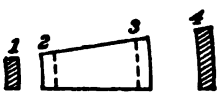
SLICE INTACT.

Interior diameter of slice, 4″.23. Exterior diameter, 8″.75.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.3964 | ..... | .0048 | ..... | 32,700 |
| 2 | 5.1600 | ..... | .00155 | ..... | 9,000 |
| 3 | 7.16795 | .00205 | ..... | 8,600 | ..... |
| 4 | 8.5659 | ..... | .0014 | ..... | 4,900 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4012 | ..... | ..... | ..... | ..... |
| 2 | 5.15905 | ..... | .0025 | ..... | 14,500 |
| 3 | 7.1678 | .0014 | ..... | 5,900 | ..... |
| 4 detached | 8.5678 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.16155 | ..... | ..... | ..... | ..... |
| 3 detached | 7.1659 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.23. Exterior diameter, 8″.75.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3924 | 4.4004 | 4.3964 |
| 2 | 5.1606 | 5.1594 | 5.1600 |
| 3 | 7.1708 | 7.1656 | 7.16795 |
| 4 | 8.5640 | 8.5678 | 8.5659 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.3972 | 4.4052 | 4.4012 |
| 2 | 5.1597 | 5.1584 | 5.15905 |
| 3 | 7.1696 | 7.1650 | 7.1673 |
| 4 detached | 8.5664 | 8.5682 | 8.5673 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1614 | 5.1617 | 5.16155 |
| 3 detached | 7.1690 | 7.1628 | 7.1659 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | +.0048 | +.0048 | +.0048 |
| 2 in slice | −.0009 | −.0010 | −.00095 |
| 3 in slice | −.0007 | −.0006 | −.00065 |
| 4 detached | +.0024 | +.0004 | +.0014 |

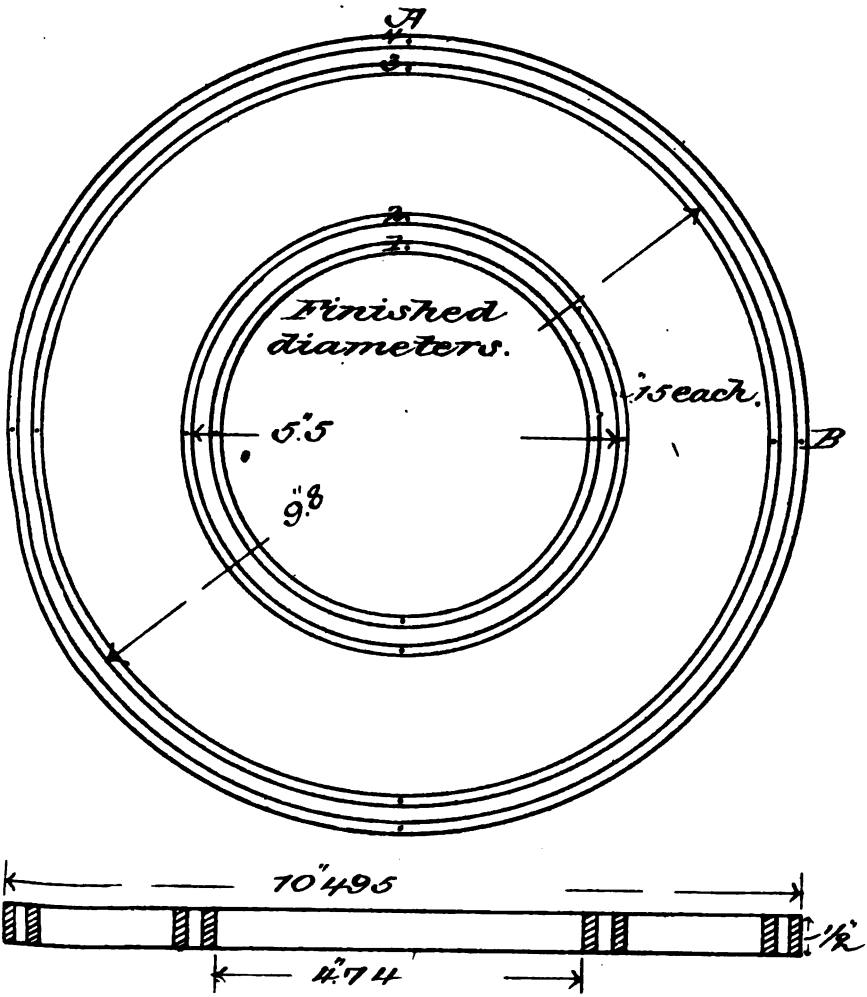
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0017 | +.0033 | +.0025 |
| 3 detached | −.0006 | −.0022 | −.0014 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0006 | +.0023 | +.00155 |
| 3 detached | −.0013 | −.0028 | −.00205 |

# 5-inch R.F. Gun Tube.
## Marks 11249 B 3.
## Breech Slice.



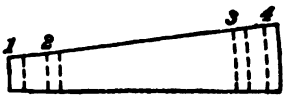
## No. 11249 $B_3$.

### BREECH SLICE.

State of internal strains and stresses at different phases of the slice.

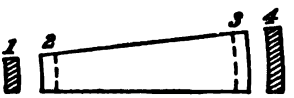
SLICE INTACT.

Interior diameter of slice, 4″.74. Exterior diameter, 10″.495.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.8978 | ..... | .00585 | ..... | 32,800 |
| 2 | 5.6368 | ..... | .00265 | ..... | 14,100 |
| 3 | 9.6468 | .00196 | ..... | 6,100 | ..... |
| 4 | 10.3211 | .0010 | ..... | 2,900 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.50. Exterior diameter, 9″.80.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.90265 | ..... | ..... | ..... | ..... |
| 2 | 5.63585 | ..... | .0041 | ..... | 21,880 |
| 3 | 9.6459 | .00105 | ..... | 3,300 | ..... |
| 4 detached | 10.3201 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.63945 | ..... | ..... | ..... | ..... |
| 3 detached | 9.64485 | ..... | ..... | ..... | ..... |

## Breech Slice.

**Interior diameter, 4".74. Exterior diameter, 10".495.**
**Original diameter of rings in the slice.**

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9996 | 4.9950 | 4.9973 |
| 2 | 5.6289 | 5.6246 | 5.6268 |
| 3 | 9.6477 | 9.6459 | 9.6468 |
| 4 | 10.3177 | 10.3245 | 10.3211 |

**Rings 1 and 4 detached; rings 2 and 3 in the slice.**

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9964 | 4.9999 | 4.99815 |
| 2 | 5.6275 | 5.6232 | 5.62535 |
| 3 | 9.6469 | 9.6449 | 9.6459 |
| 4 detached | 10.3246 | 10.3156 | 10.3201 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6415 | 5.6374 | 5.63945 |
| 3 detached | 9.6451 | 9.6446 | 9.64485 |

**Breech strains released.**

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0056 | +.0049 | +.00525 |
| 2 in slice | −.0015 | −.0014 | −.00145 |
| 3 in slice | −.0008 | −.0010 | −.0009 |
| 4 detached | +.0069 | −.0069 | −.0070 |

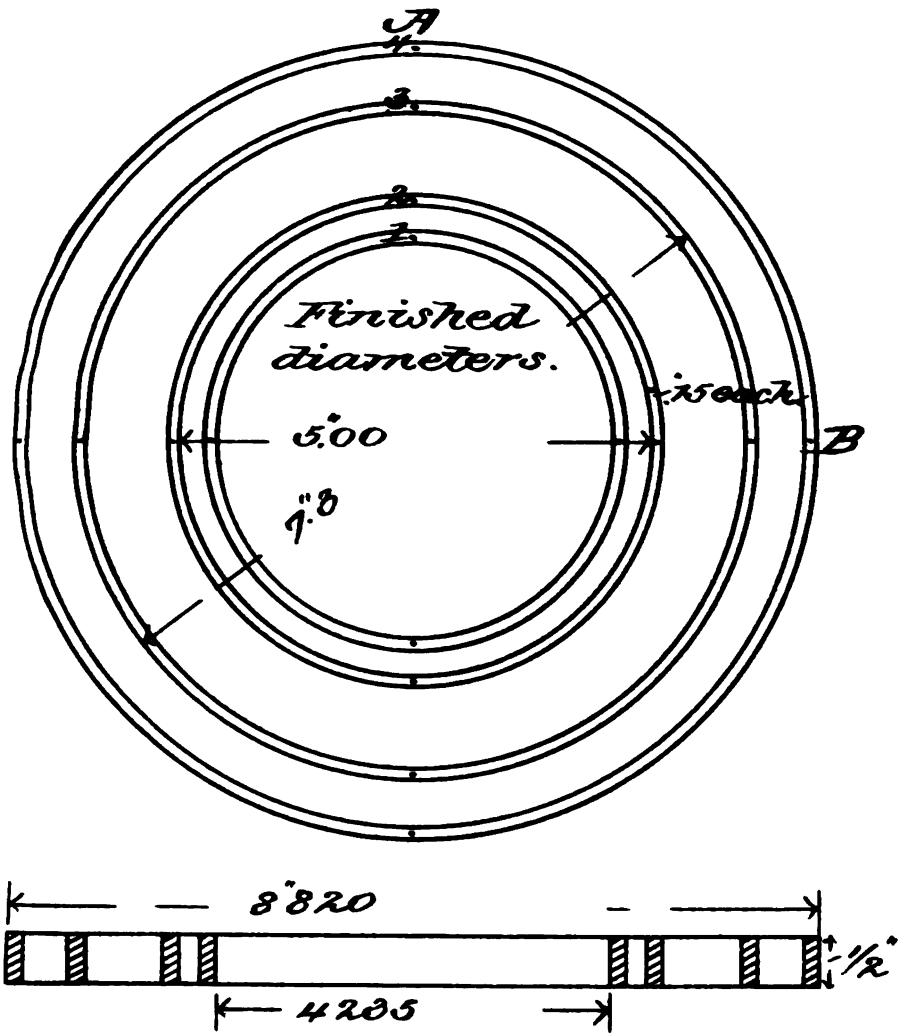
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0040 | +.0042 | +.0041 |
| 3 detached | −.0018 | −.0009 | −.00105 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0025 | +.0028 | +.00265 |
| 3 detached | −.0026 | −.0013 | −.00195 |

# 5-inch R.F. Gun Tube.
## Marks 11249 B3.
## Muzzle Slice.



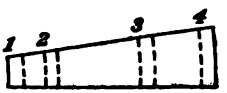
## No. 11249 $B_3$.

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

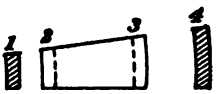
SLICE INTACT.

Interior diameter of slice, 4″.235. Exterior diameter, 8″.820.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.39655 | | .00415 | | 28,300 |
| 2 | 5.1543 | | .00095 | | 5,500 |
| 3 | 7.1558 | .00115 | | 4,800 | |
| 4 | 8.64175 | .00165 | | 5,700 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4007 | | | | |
| 2 | 5.1536 | | .00165 | | 9,600 |
| 3 | 7.15555 | .0009 | | 3,700 | |
| 4 detached | 8.6401 | | | | |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.15525 | | | | |
| 3 detached | 7.15465 | | | | |

## Muzzle Slice.

Interior diameter, 4″.235. Exterior diameter, 8″.820.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3961 | 4.3970 | 4.39655 |
| 2 | 5.1517 | 5.1569 | 5.1543 |
| 3 | 7.1575 | 7.1541 | 7.1558 |
| 4 | 8.6447 | 8.6388 | 8.64175 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4000 | 4.4014 | 4.4007 |
| 2 | 5.1510 | 5.1562 | 5.1536 |
| 3 | 7.1574 | 7.1537 | 7.15555 |
| 4 detached | 8.6405 | 8.6397 | 8.6401 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1520 | 5.1585 | 5.15525 |
| 3 detached | 7.1565 | 7.1528 | 7.15465 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0089 | +.0044 | +.00415 |
| 2 in slice | −.0007 | −.0007 | −.0007 |
| 3 in slice | −.0001 | −.0004 | −.00025 |
| 4 detached | −.0042 | +.0009 | −.00165 |

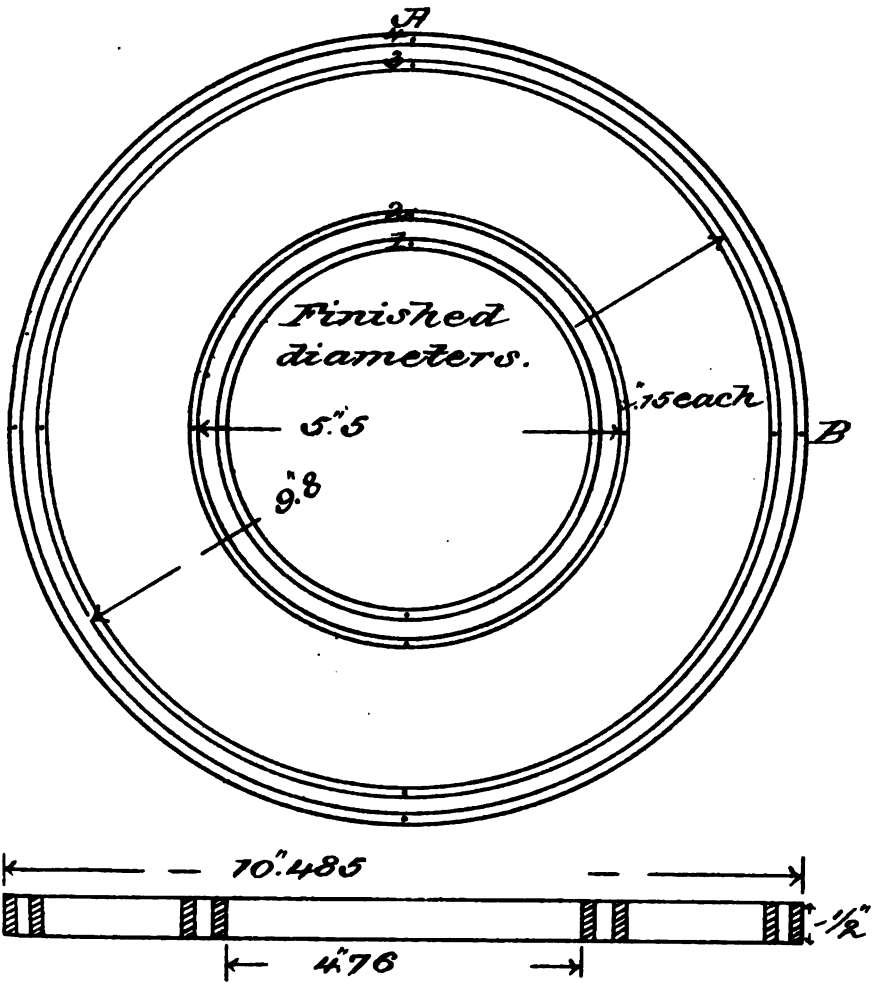
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0010 | +.0023 | +.00165 |
| 3 detached | −.0009 | −.0009 | −.0009 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0003 | +.0016 | +.00095 |
| 3 detached | −.0010 | −.0013 | −.00115 |

5-inch R.F. Gun Tube.
Marks 1 1272 B1.
Breech Slice.



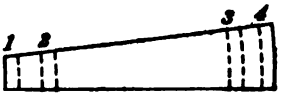
## No. 11272, $B_1$.

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

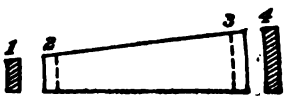
#### SLICE INTACT.

Interior diameter of slice, 4″.76. Exterior diameter, 10″.485.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds* |
| 1 | 4.92005 | ..... | .00525 | ..... | 32,000 |
| 2 | 5.68885 | ..... | .0022 | ..... | 11,700 |
| 3 | 9.6357 | .0022 | ..... | 6,800 | ..... |
| 4 | 10.2990 | .0029 | ..... | 8,400 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.9258 | ..... | ..... | ..... | ..... |
| 2 | 5.6871 | ..... | .00845 | ..... | 18,400 |
| 3 | 9.63505 | .00155 | ..... | 4,800 | ..... |
| 4 detached | 10.2961 | ..... | ..... | ..... | ..... |

#### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.64055 | ..... | ..... | ..... | ..... |
| 3 detached | 9.6385 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.74. Exterior diameter, 10″.495.
Original diameter of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.8996 | 4.8950 | 4.8973 |
| 2 | 5.6390 | 5.6346 | 5.6368 |
| 3 | 9.6477 | 9.6459 | 9.6468 |
| 4 | 10.3177 | 10.3245 | 10.3211 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9054 | 4.8999 | 4.90265 |
| 2 | 5.6375 | 5.6332 | 5.63536 |
| 3 | 9.6469 | 9.6449 | 9.6459 |
| 4 detached | 10.3246 | 10.3156 | 10.3201 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6415 | 5.6374 | 5.63945 |
| 3 detached | 9.6451 | 9.6446 | 9.64485 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0058 | +.0049 | +.00585 |
| 2 in slice | −.0015 | −.0014 | −.00145 |
| 3 in slice | −.0008 | −.0010 | −.0009 |
| 4 detached | +.0069 | −.0089 | −.0010 |

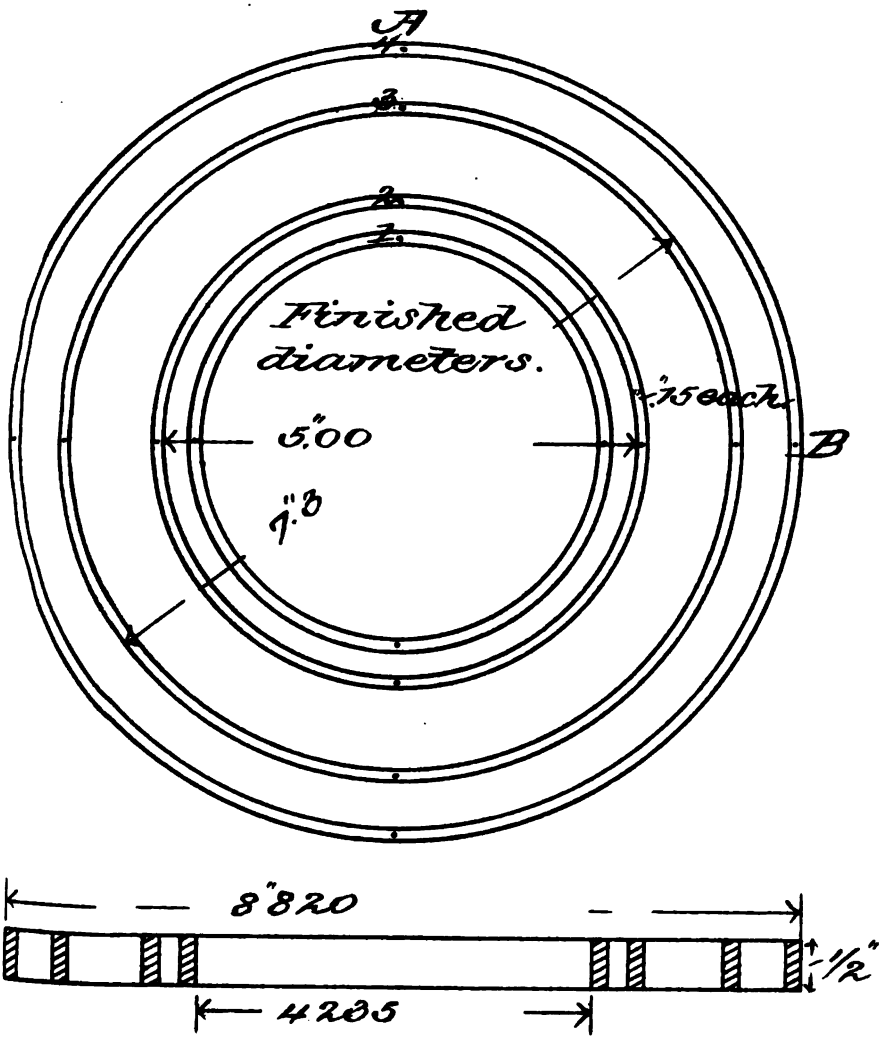
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0040 | +.0042 | +.0041 |
| 3 detached | −.0018 | −.0008 | −.00105 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0025 | +.0028 | +.00265 |
| 3 detached | −.0026 | −.0013 | −.00195 |

5-inch R.F. Gun Tube.
Marks 77249 B3.
Muzzle Slice.



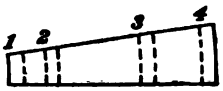
## No. 11249 $B_3$.

### Muzzle Slice.

**State of internal strains and stresses at different phases of the slice.**

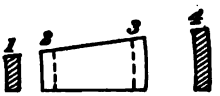
#### SLICE INTACT.

Interior diameter of slice, 4″.235. Exterior diameter, 8″.820.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.89655 | | .00415 | | 28,300 |
| 2 | 5.1543 | | .00095 | | 5,500 |
| 3 | 7.1558 | .00115 | | 4,800 | |
| 4 | 8.64175 | .00165 | | 5,700 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4007 | | | | |
| 2 | 5.1536 | | .00165 | | 9,600 |
| 3 | 7.15555 | .0009 | | 3,700 | |
| 4 detached | 8.6401 | | | | |

#### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.15525 | | | | |
| 3 detached | 7.15465 | | | | |

## Muzzle Slice.

Interior diameter, 4″.235. Exterior diameter, 8″.820.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3961 | 4.3970 | 4.39655 |
| 2 | 5.1517 | 5.1569 | 5.1543 |
| 3 | 7.1575 | 7.1541 | 7.1558 |
| 4 | 8.6447 | 8.6388 | 8.64175 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4000 | 4.4014 | 4.4007 |
| 2 | 5.1510 | 5.1562 | 5.1536 |
| 3 | 7.1574 | 7.1537 | 7.15555 |
| 4 detached | 8.6405 | 8.6397 | 8.6401 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1520 | 5.1585 | 5.15525 |
| 3 detached | 7.1565 | 7.1528 | 7.15465 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0039 | +.0044 | +.00415 |
| 2 in slice | −.0007 | −.0007 | −.0007 |
| 3 in slice | −.0001 | −.0004 | −.00025 |
| 4 detached | −.0042 | +.0009 | −.00165 |

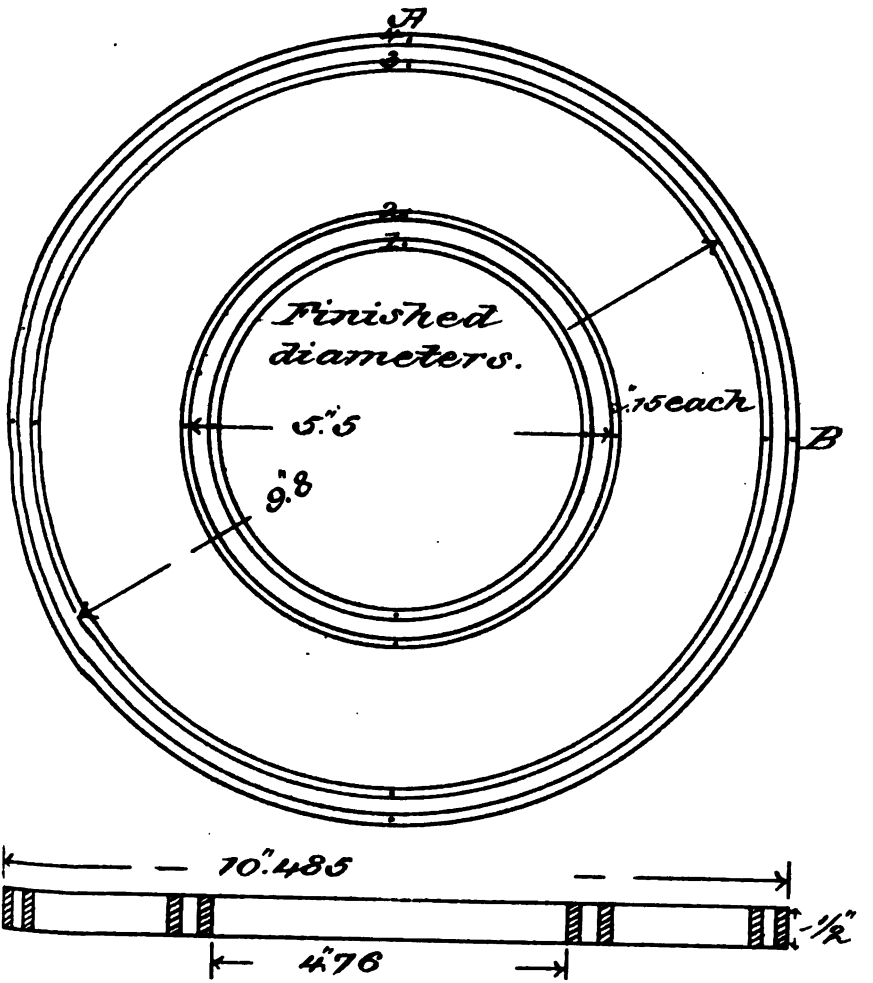
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0010 | +.0023 | +.00165 |
| 3 detached | −.0009 | −.0009 | −.0009 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0008 | +.0016 | +.00095 |
| 3 detached | −.0010 | −.0013 | −.00115 |

# 5-inch R.F. Gun Tube.
## Marks 11 2 7 2 $B_1$.
## Breech Slice.



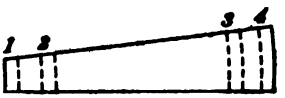
## No. 11272, $B_1$.

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

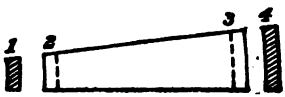
SLICE INTACT.

Interior diameter of slice, 4″.76. Exterior diameter, 10″.485.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds* |
| 1 | 4.92005 | ..... | .00525 | ..... | 32,000 |
| 2 | 5.63835 | ..... | .0022 | ..... | 11,700 |
| 3 | 9.6357 | .0022 | ..... | 6,800 | ..... |
| 4 | 10.2990 | .0029 | ..... | 8,400 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.9258 | ..... | ..... | ..... | ..... |
| 2 | 5.6371 | ..... | .00345 | ..... | 18,400 |
| 3 | 9.63505 | .00155 | ..... | 4,800 | ..... |
| 4 detached | 10.2961 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.64055 | ..... | ..... | ..... | ..... |
| 3 detached | 9.6335 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.76. Exterior diameter, 10″.485.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9237 | 4.9164 | 4.92005 |
| 2 | 5.6407 | 5.6360 | 5.63835 |
| 3 | 9.6380 | 9.6334 | 9.6357 |
| 4 | 10.3085 | 10.2945 | 10.2990 |

Rings 1 and 4 detached, rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9291 | 4.9215 | 4.9253 |
| 2 | 5.6395 | 5.6347 | 5.6371 |
| 3 | 9.6375 | 9.6326 | 9.63505 |
| 4 detached | 10.2960 | 10.2962 | 10.2961 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6424 | 5.6387 | 5.64055 |
| 3 detached | 9.6370 | 9.6300 | 9.6335 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0054 | +.0051 | +.00525 |
| 2 in slice | −.0012 | −.0013 | −.00125 |
| 3 in slice | −.0005 | −.0008 | −.00065 |
| 4 detached | −.0076 | +.0017 | −.0029 |

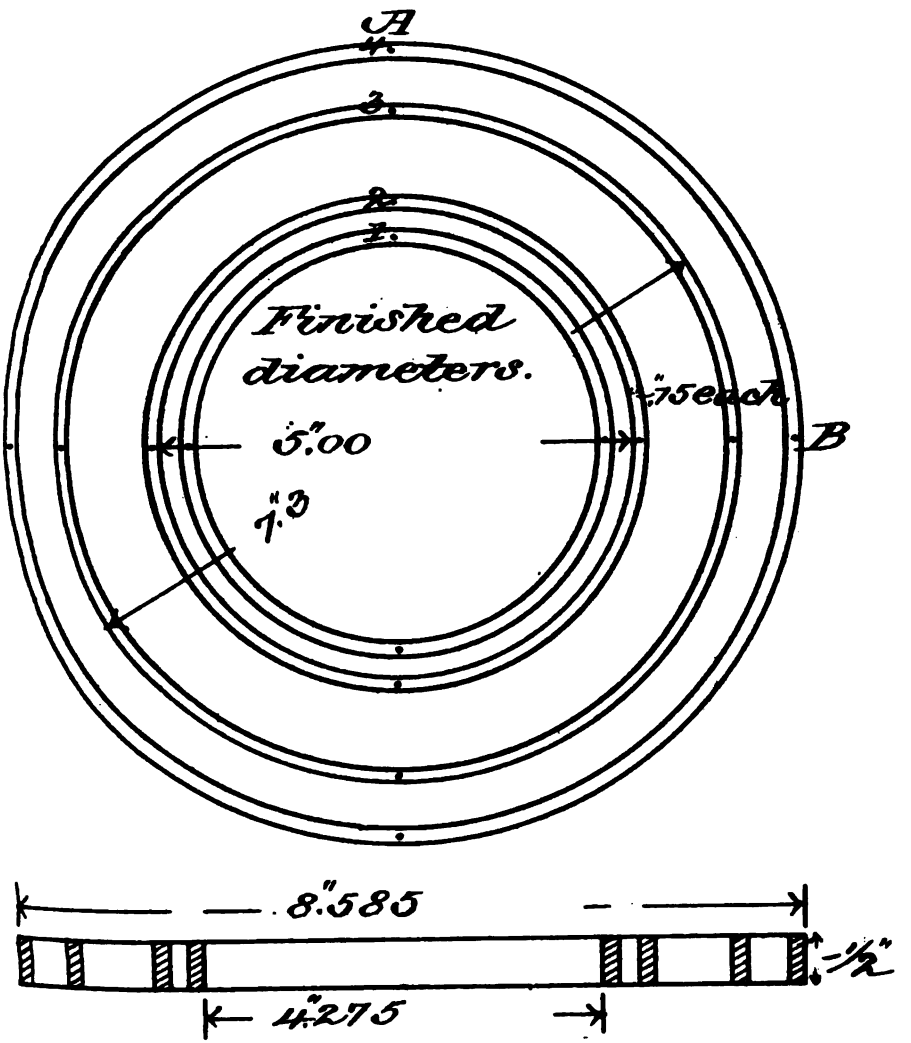
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0029 | +.0040 | +.00345 |
| 3 detached | −.0005 | −.0026 | −.00155 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0077 | +.0027 | +.0022 |
| 3 detached | −.0010 | −.0034 | −.0022 |

5-inch R.F. Gun Tube.
Marks 11272 B1.
Muzzle Slice.



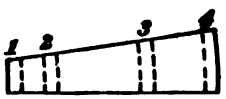
## No. 11272 $B_1$.

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

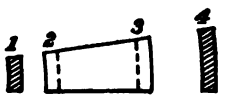
#### SLICE INTACT.

Interior diameter of slice, 4″.275. Exterior diameter, 8″.585.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.42795 | | .00325 | | 22,000 |
| 2 | 5.1464 | | .0014 | | 8,200 |
| 3 | 7.1450 | .0010 | | 4,100 | |
| 4 | 8.4044 | .0017 | | 6,100 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.4312 | | | | |
| 2 | 5.1454 | | .0024 | | 14,000 |
| 3 | 7.1444 | .0004 | | 1,700 | |
| 4 detached | 8.4027 | | | | |

#### RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.1478 | | | | |
| 3 detached | 7.1440 | | | | |

## Muzzle Slice.

Interior diameter, 4″.275. Exterior diameter, 8″.585.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4250 | 4.4309 | 4.42795 |
| 2 | 5.1455 | 5.1473 | 5.1464 |
| 3 | 7.1463 | 7.1473 | 7.1450 |
| 4 | 8.4067 | 8.4001 | 8.4044 |

Rings 1 and 4 detached. Rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4284 | 4.4340 | 4.4312 |
| 2 | 5.1446 | 5.1462 | 5.1454 |
| 3 | 7.1459 | 7.1429 | 7.1444 |
| 4 detached | 8.4029 | 8.4025 | 8.4027 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1470 | 5.1486 | 5.1478 |
| 3 detached | 7.1463 | 7.1417 | 7.1440 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0034 | +.0031 | +.00325 |
| 2 in slice | −.0009 | −.0011 | −.0010 |
| 3 in slice | −.0004 | −.0008 | −.0006 |
| 4 detached | −.0058 | +.0024 | −.0017 |

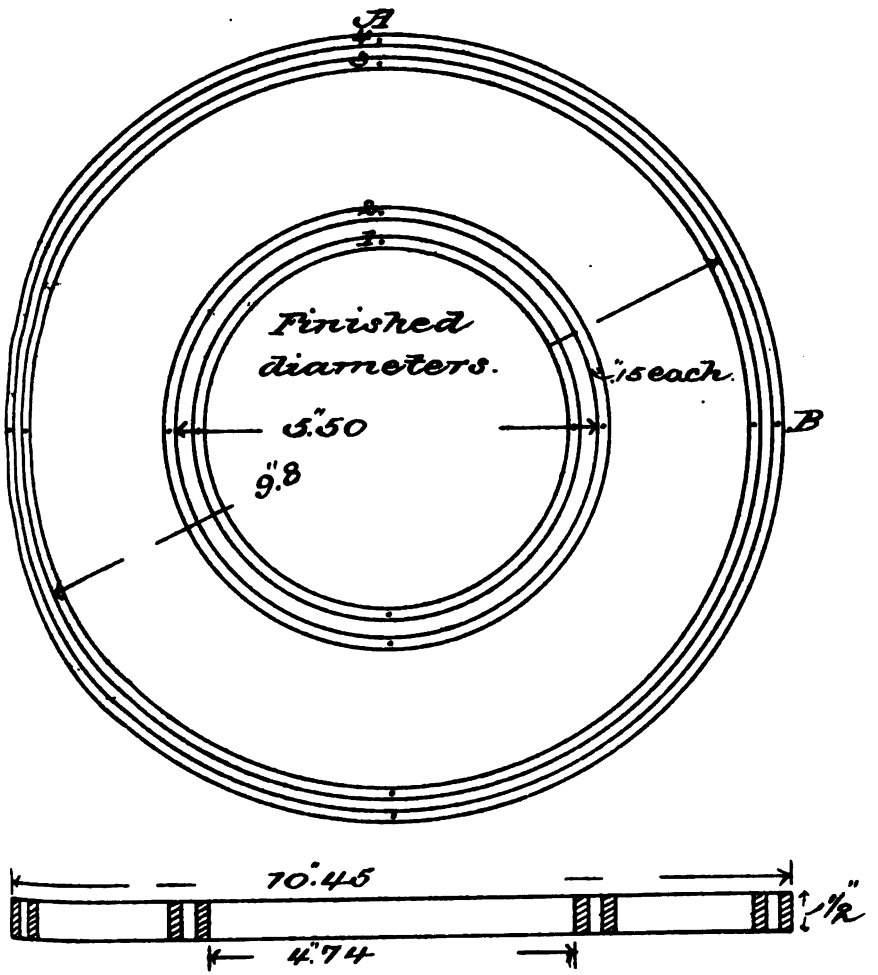
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0024 | +.0024 | +.0024 |
| 3 detached | +.0004 | −.0012 | −.0004 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0015 | +.0013 | +.0014 |
| 3 detached | .0000 | −.0020 | −.0010 |

5-inch R.F. Gun Tube.
Marks 11,12,12.B3.
Breech Slice.



## No. 11272 $B_2$.

### Breech Slice.

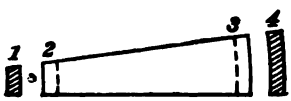
**State of internal strains and stresses at different phases of the slice.**

SLICED INTACT.

**Interior diameter of slice, 4″.74. Exterior diameter, 10″.45.**

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.90225 | ..... | .0043 | ..... | 26,300 |
| 2 | 5.65205 | ..... | .00275 | ..... | 14,600 |
| 3 | 9.6368 | .0082 | ..... | 10,000 | ..... |
| 4 | 10.29675 | .0010 | ..... | 2,900 | ..... |

**Rings 1 and 4 detached; rings 2 and 3 in the slice.**
**Interior diameter of slice, 5″.5. Exterior diameter, 9″.8.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.90655 | ..... | ..... | ..... | ..... |
| 2 | 5.6509 | ..... | .0089 | ..... | 20,700 |
| 3 | 9.63605 | .00245 | ..... | 7,600 | ..... |
| 4 detached | 10.29675 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.6548 | ..... | ..... | ..... | ..... |
| 3 detached | 9.6386 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.74. Exterior diameter, 10″.45.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9025 | 4.9020 | 4.90225 |
| 2 | 5.6517 | 5.6524 | 5.65205 |
| 3 | 9.6379 | 9.6357 | 9.6368 |
| 4 | 10.2986 | 10.2999 | 10.29875 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9075 | 4.9056 | 4.90655 |
| 2 | 5.6508 | 5.6510 | 5.6509 |
| 3 | 9.6371 | 9.6350 | 9.63605 |
| 4 detached | 10.2830 | 10.3085 | 10.29575 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6551 | 5.6545 | 5.6548 |
| 3 detached | 9.6350 | 9.6322 | 9.6336 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0050 | +.0036 | +.0043 |
| 2 in slice | −.0009 | −.0014 | −.00115 |
| 3 in slice | −.0008 | −.0007 | −.00075 |
| 4 detached | −.0106 | +.0086 | −.0010 |

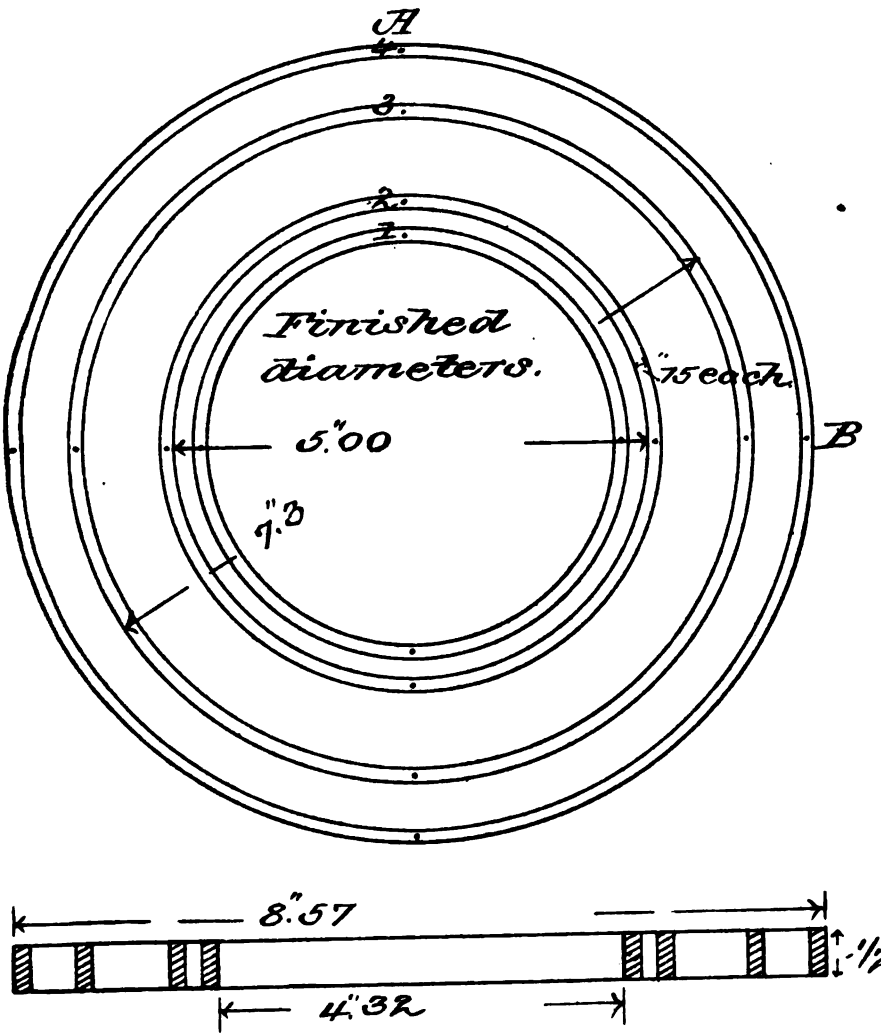
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0043 | +.0035 | +.0039 |
| 3 detached | −.0021 | −.0028 | −.00245 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0034 | +.0021 | +.00275 |
| 3 detached | −.0029 | −.0035 | −.0032 |

# 5-inch R. F. Gun Tube.
## Mark 11 2 7 2 B 2.
## Muzzle Slice.



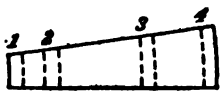
## No. 11272 $B_2$.

### Muzzle Slice.

**State of internal strains and stresses at different phases of the slice.**

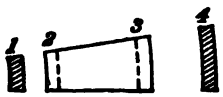
SLICE INTACT.

**Interior diameter of slice, 4″.32. Exterior diameter, 8″.57.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 8.4642 | ..... | .00425 | ..... | 15,100 |
| 2 | 5.14855 | ..... | .0017 | ..... | 9,900 |
| 3 | 7.1485 | .00215 | ..... | 9,000 | ..... |
| 4 | 8.4139 | .00255 | ..... | 9,100 | ..... |

**Rings 1 and 4 detached; rings 2 and 3 in the slice.**
**Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.46845 | ..... | ..... | ..... | ..... |
| 2 | 5.1480 | ..... | .00225 | ..... | 13,100 |
| 3 | 7.1480 | .00165 | ..... | 6,900 | ..... |
| 4 detached | 8.41135 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.15025 | ..... | ..... | ..... | ..... |
| 3 detached | 7.14635 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.32. Exterior diameter, 8″.57.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4646 | 4.4638 | 4.4642 |
| 2 | 5.1501 | 5.1470 | 5.14855 |
| 3 | 7.1515 | 7.1455 | 7.1485 |
| 4 | 8.4185 | 8.4093 | 8.4139 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4691 | 4.4678 | 4.46845 |
| 2 | 5.1494 | 5.1466 | 5.1480 |
| 3 | 7.1506 | 7.1454 | 7.1480 |
| 4 detached | 8.4225 | 8.4002 | 8.41135 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1514 | 5.1491 | 5.15025 |
| 3 detached | 7.1497 | 7.1480 | 7.14635 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0045 | +.0040 | +.00425 |
| 2 in slice | −.0007 | −.0004 | −.00055 |
| 3 in slice | −.0009 | −.0001 | −.0005 |
| 4 detached | +.0040 | −.0091 | −.00255 |

SECOND TO THIRD PHASE.

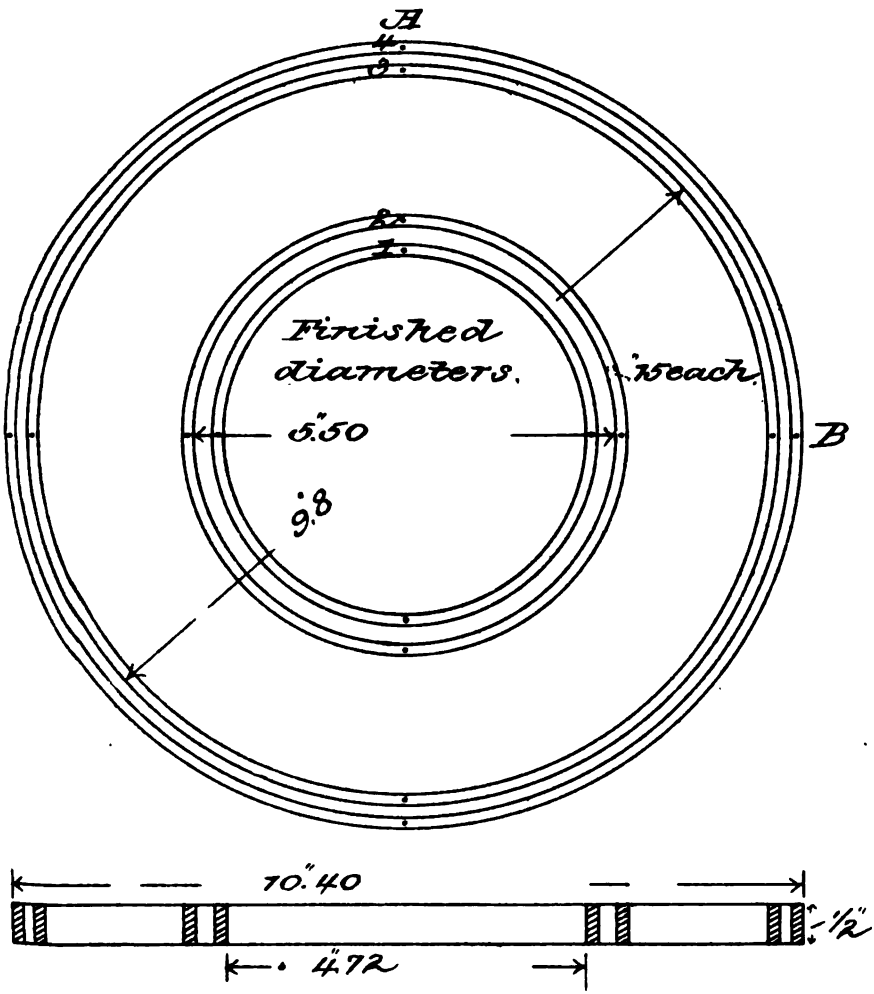
| | | | |
|---|---|---|---|
| 2 detached | +.0020 | +.0025 | +.00225 |
| 3 detached | −.0009 | −.0024 | −.00165 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0013 | +.0021 | +.0017 |
| 3 detached | −.0018 | −.0024 | −.00215 |

5-inch R. F. Gun Tube
Accepted tube 11,272 $B_2$.

Breech Slice, annealed.

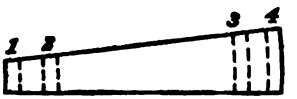


## No. 11272 $B_2$.

**Breech slice, annealed at temperature of 1,000° F.**
**State of internal strains and stresses at different phases of the slice.**

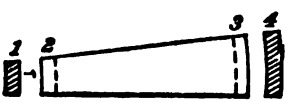
SLICE INTACT.

**Interior diameter of slice, 4″.72. Exterior diameter, 10″.40.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.8812 | ..... | .0009 | ..... | 5,500 |
| 2 | 5.65096 | ..... | .0010 | ..... | 5,300 |
| 3 | 9.6370 | .00025 | ..... | 800 | ..... |
| 4 | 10.2468 | ..... | .00075 | ..... | 2,200 |

**Rings 1 and 4 detached; rings 2 and 3 in the slice.**
**Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.8821 | ..... | ..... | ..... | ..... |
| 2 | 5.6509 | ..... | .00105 | ..... | 5,600 |
| 3 | 9.6369 | .00015 | ..... | 500 | ..... |
| 4 detached | 10.24755 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.65195 | ..... | ..... | ..... | ..... |
| 3 detached | 9.63675 | ..... | ..... | ..... | ..... |

## Breech Slice, Annealed at Temperature of 1000° F.

Interior diameter, 4″.72. Exterior diameter, 10″.40.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.8856 | 4.8768 | 4.88120 |
| 2 | 5.6490 | 5.6529 | 5.65095 |
| 3 | 9.6389 | 9.6351 | 9.63700 |
| 4 | 10.2450 | 10.2486 | 10.24680 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.8867 | 4.8775 | 4.88210 |
| 2 | 5.6489 | 5.6529 | 5.65090 |
| 3 | 9.6388 | 9.6350 | 9.63690 |
| 4 detached | 10.2564 | 10.2387 | 10.24755 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6499 | 5.6540 | 5.65195 |
| 3 detached | 9.6410 | 9.6325 | 9.63675 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0011 | +.0007 | +.0009 |
| 2 | —.0001 | .0000 | —.00005 |
| 3 | —.0001 | —.0001 | —.0001 |
| 4 detached | +.0114 | —.0099 | +.00075 |

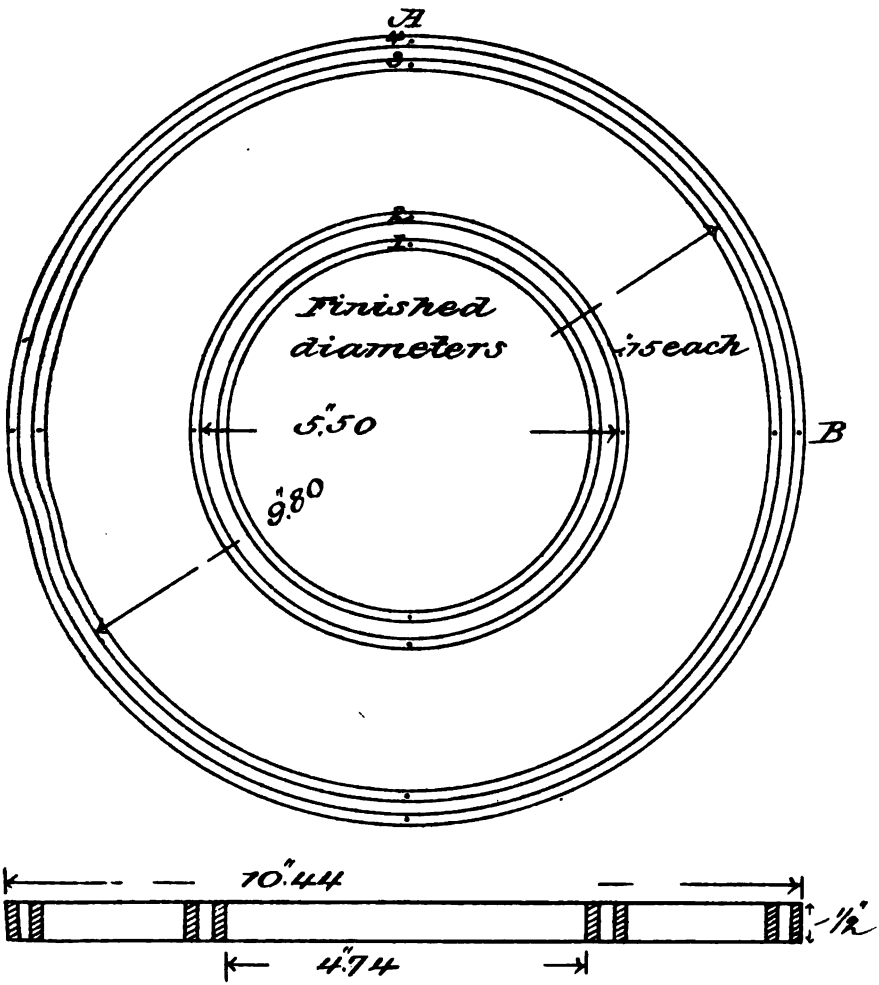
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0010 | +.0011 | +.00105 |
| 3 detached | +.0022 | —.0025 | —.00015 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0009 | +.0011 | +.0010 |
| 3 detached | +.0021 | —.0026 | —.00025 |

5-inch R.F. Gun Tube.
Marks 11212 B3.
Breech Slice.



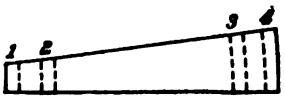
## No. 11272 $B_3$.

### Breech Slice.

**State of internal strains and stresses at different phases of the slice.**

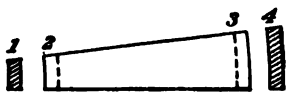
SLICE INTACT.

**Interior diameter of slice, 4″.74. Exterior diameter, 10″.44.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.90545 | | .0082 | | 19,600 |
| 2 | 5.6608 | | .0010 | | 5,800 |
| 3 | 9.65195 | .0010 | | 3,200 | |
| 4 | 10.2788 | .0002 | | 600 | |

**Rings 1 and 4 detached; rings 2 and 3 in the slice.**
**Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.**




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.90865 | | | | |
| 2 | 5.65925 | | .00205 | | 10,900 |
| 3 | 9.65115 | .0002 | | 600 | |
| 4 detached | 10.2786 | | | | |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.6613 | | | | |
| 3 detached | 9.65095 | | | | |

## Breech Slice.

Interior diameter, 4″.74. Exterior diameter 10″.44.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9058 | 4.9051 | 4.90545 |
| 2 | 5.6578 | 5.6633 | 5.6603 |
| 3 | 9.6520 | 9.6519 | 9.65195 |
| 4 | 10.2714 | 10.2762 | 10.2738 |

Rings 1 and 4 detached. Rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9081 | 4.9092 | 4.90865 |
| 2 | 5.6561 | 5.6624 | 5.65925 |
| 3 | 9.6512 | 9.6511 | 9.65115 |
| 4 detached | 10.2804 | 10.2668 | 10.2736 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6576 | 5.6650 | 5.6613 |
| 3 detached | 9.6506 | 9.6513 | 9.65095 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0023 | +.0041 | +.0032 |
| 2 in slice | −.0012 | −.0009 | −.00105 |
| 3 in slice | −.0008 | −.0008 | −.0008 |
| 4 detached | +.0090 | −.0094 | −.0002 |

SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0015 | +.0026 | +.00205 |
| 3 detached | −.0006 | +.0002 | −.0002 |

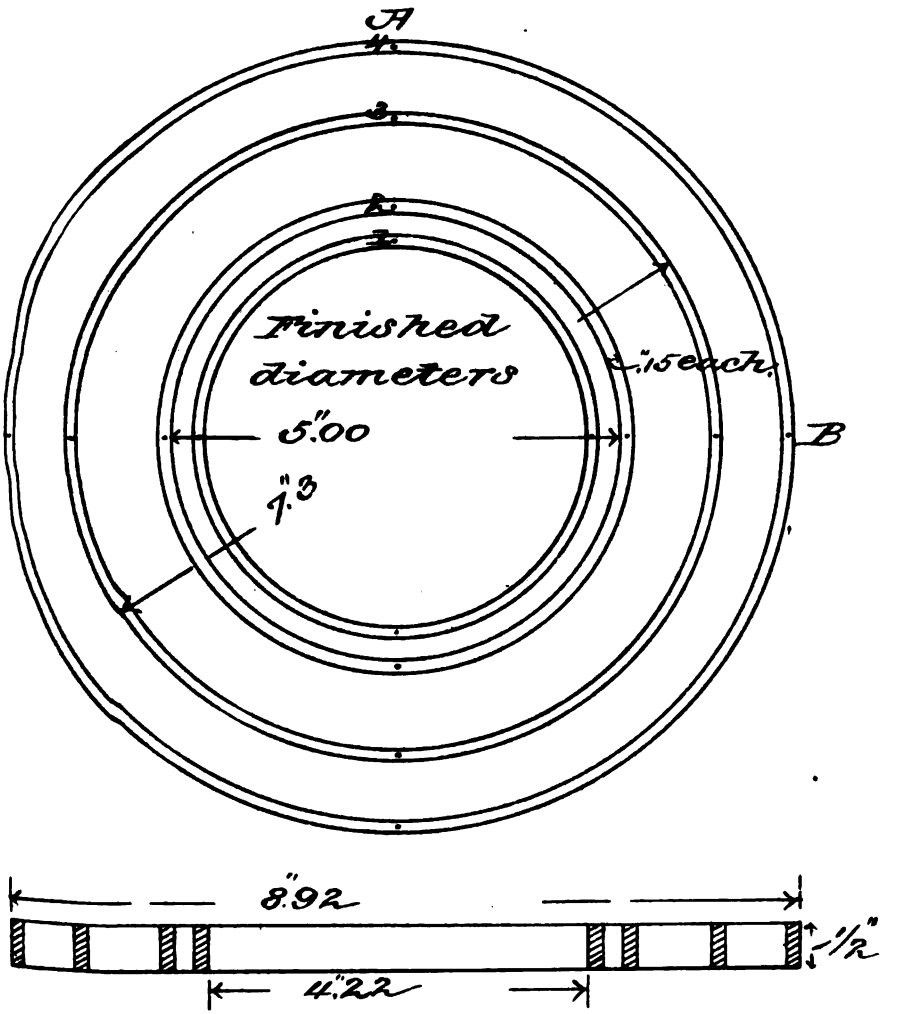
FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0008 | +.0017 | +.0010 |
| 3 detached | −.0014 | −.0006 | −.0010 |

5-inch R. F. Gun Tube.

Marks 11,272 B 3.

Muzzle Slice.



## No. 11272 $B_3$.

### Muzzle Slice.

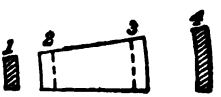
State of internal strains and stresses at different phases of the slice.

SLICE INTACT.

Interior diameter of slice, 4″.22. Exterior diameter, 8″.92.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.4067 | ..... | .00305 | ..... | 20,800 |
| 2 | 5.15585 | ..... | .00075 | ..... | 4,400 |
| 3 | 7.15015 | .0008 | ..... | 8,400 | ..... |
| 4 | 8.75245 | .00125 | ..... | 4,800 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.40975 | ..... | ..... | ..... | ..... |
| 2 | 5.15525 | ..... | .00135 | ..... | 7,800 |
| 3 | 7.1496 | .00025 | ..... | 1,000 | ..... |
| 4 detached | 8.7512 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.1566 | ..... | ..... | ..... | ..... |
| 3 detached | 7.14985 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.22. Exterior diameter, 8″.92.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.4072 | 4.4062 | 4.4067 |
| 2 | 5.1526 | 5.1591 | 5.15585 |
| 3 | 7.1458 | 7.1545 | 7.15015 |
| 4 | 8.7541 | 8.7508 | 8.75245 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.4107 | 4.4088 | 4.40975 |
| 2 | 5.1524 | 5.1581 | 5.15525 |
| 3 | 7.1455 | 7.1537 | 7.1496 |
| 4 detached | 8.7464 | 8.7560 | 8.7512 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1536 | 5.1596 | 5.1566 |
| 3 detached | 7.1454 | 7.1533 | 7.14935 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0085 | +.0026 | +.00305 |
| 2 in slice | −.0002 | −.0010 | −.0006 |
| 3 in slice | −.0008 | −.0008 | −.00055 |
| 4 detached | | | |

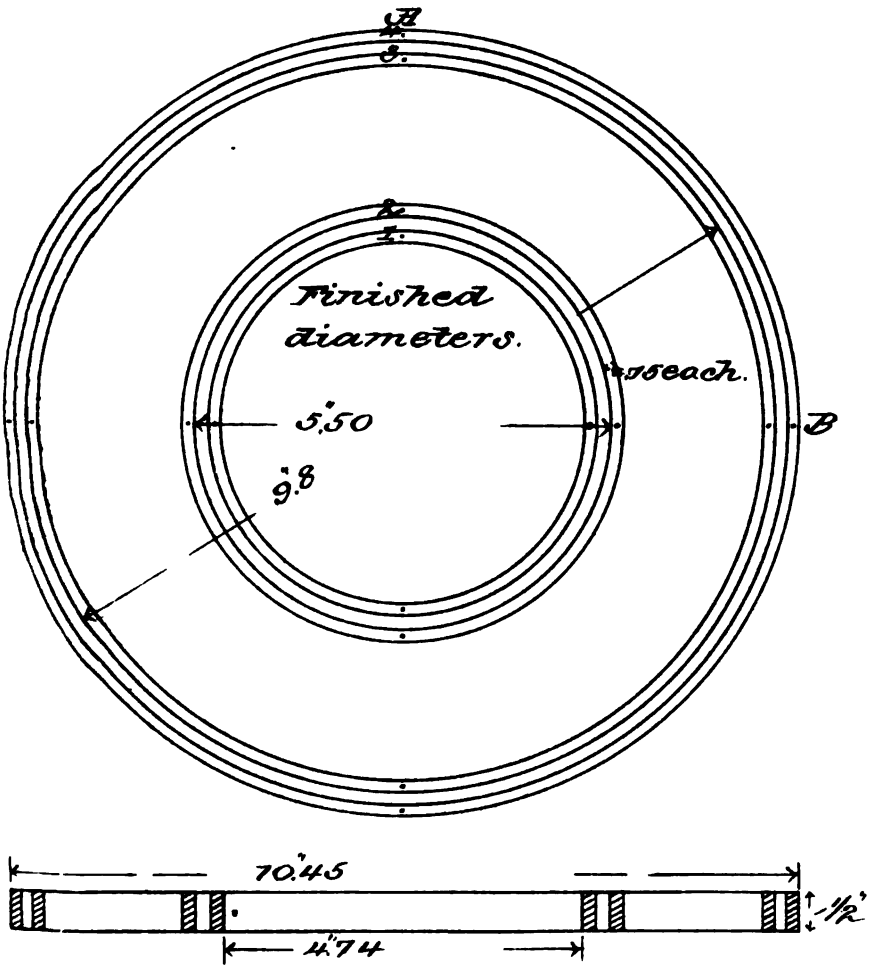
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0012 | +.0015 | +.00135 |
| 3 detached | −.0001 | −.0004 | −.00025 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0010 | +.0005 | +.00075 |
| 3 detached | −.0004 | −.0012 | −.0008 |

# 6-inch R. F. Gun Tube.
## Marks 7727 2 B 2.
## Breech Slice.



## No. 11272 $B_3$.

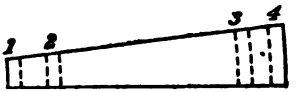
(Second treatment.)

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

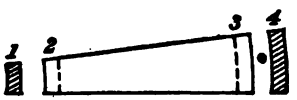
SLICE INTACT.

Interior diameter of slice, 4″.74. Exterior diameter, 10″.45.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.89595 | ..... | .00655 | ..... | 40,100 |
| 2 | 5.65695 | ..... | .00485 | ..... | 25,700 |
| 3 | 9.6434 | .0058 | ..... | 18,000 | ..... |
| 4 | 10.27355 | .00485 | ..... | 14,160 | ..... |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.9025 | ..... | ..... | ..... | ..... |
| 2 | 5.65545 | ..... | .00635 | ..... | 33,700 |
| 3 | 9.64235 | .00475 | ..... | 14,800 | ..... |
| 4 detached | 10.2685 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.6618 | ..... | ..... | ..... | ..... |
| 3 | 9.6876 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.74. Exterior diameter, 10″.45.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.8969 | 4.8950 | 4.89595 |
| 2 | 5.6560 | 5.6579 | 5.65695 |
| 3 | 9.6432 | 9.6436 | 9.6434 |
| 4 | 10.2743 | 10.2724 | 10.27335 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9038 | 4.9012 | 4.9025 |
| 2 | 5.6544 | 5.6565 | 5.65545 |
| 3 | 9.6421 | 9.6426 | 9.64235 |
| 4 detached | 10.2689 | 10.2681 | 10.2685 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6607 | 5.6629 | 5.6618 |
| 3 detached | 9.6381 | 9.6371 | 9.6376 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0069 | +.0062 | +.00655 |
| 2 in slice | −.0016 | −.0014 | −.0015 |
| 3 in slice | −.0011 | −.0010 | −.00105 |
| 4 detached | −.0054 | −.0043 | −.00485 |

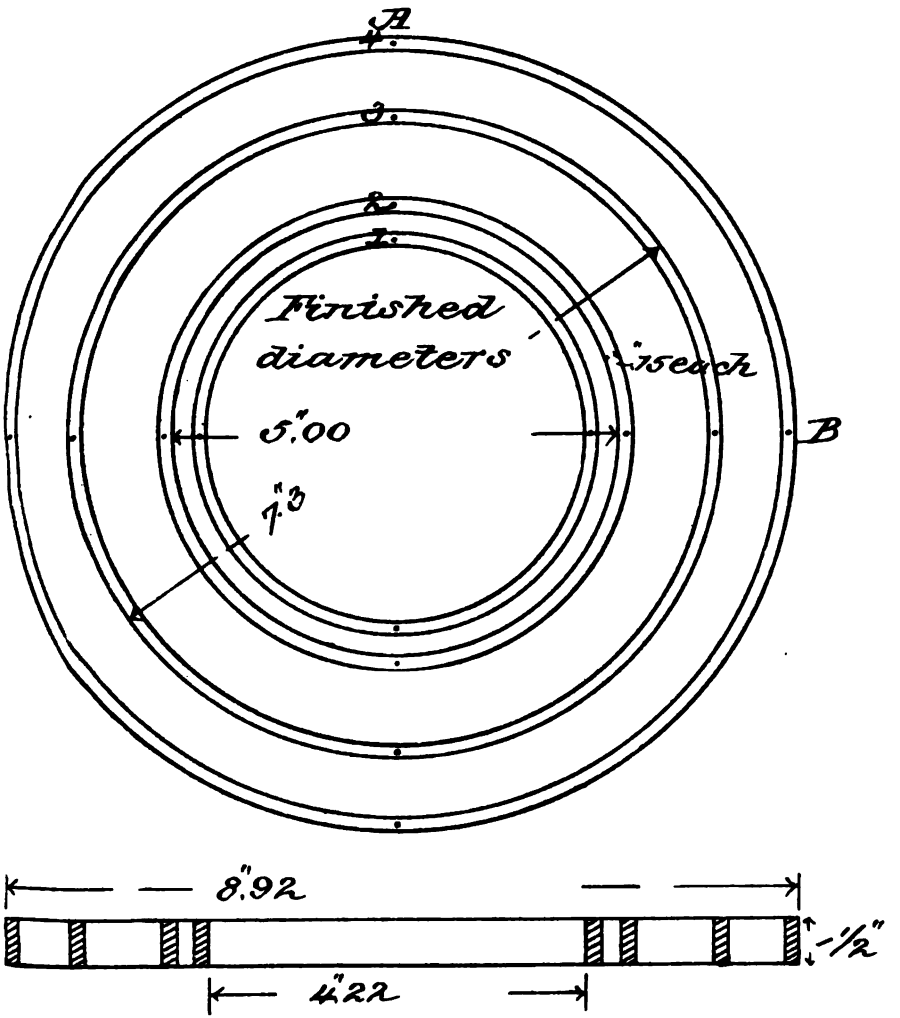
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0063 | +.0064 | +.00635 |
| 3 detached | −.0040 | −.0055 | −.00475 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0047 | +.0050 | +.00485 |
| 3 detached | −.0051 | −.0065 | −.0058 |

# 5-inch R.F. Gun Tube.
## Marks 11272 B3.
## Muzzle Slice.



## No. 11272 $B_3$.

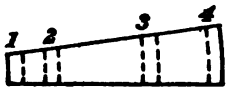
(Second treatment.)

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

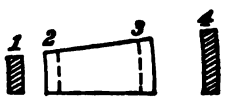
SLICE INTACT.

Interior diameter of slice, 4″.22. Exterior diameter, 8″.92.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.88315 | | .0058 | | 39,700 |
| 2 | 5.1487 | | .0043 | | 25,100 |
| 3 | 7.14875 | .0038 | | 15,900 | |
| 4 | 8.7781 | .00255 | | 8,700 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.88895 | | | | |
| 2 | 5.14855 | | .00445 | | 25,900 |
| 3 | 7.14905 | .0041 | | 17,200 | |
| 4 detached | 8.77055 | | | | |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.1530 | | | | |
| 3 detached | 7.14495 | | | | |

## Muzzle Slice.

Interior diameter, 4".22. Exterior diameter, 8".92.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3904 | 4.3859 | 4.38815 |
| 2 | 5.1468 | 5.1511 | 5.1487 |
| 3 | 7.1454 | 7.1521 | 7.14875 |
| 4 | 8.7757 | 8.7705 | 8.7731 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.3849 | 4.3930 | 4.38895 |
| 2 | 5.1465 | 5.1506 | 5.14855 |
| 3 | 7.1460 | 7.1521 | 7.14905 |
| 4 detached | 8.7635 | 8.7776 | 8.77055 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1514 | 5.1546 | 5.1530 |
| 3 detached | 7.1421 | 7.1478 | 7.14495 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0045 | +.0071 | +.0058 |
| 2 in slice | +.0002 | −.0005 | −.00015 |
| 3 in slice | +.0006 | .0000 | +.0003 |
| 4 detached | −.0122 | +.0071 | −.00255 |

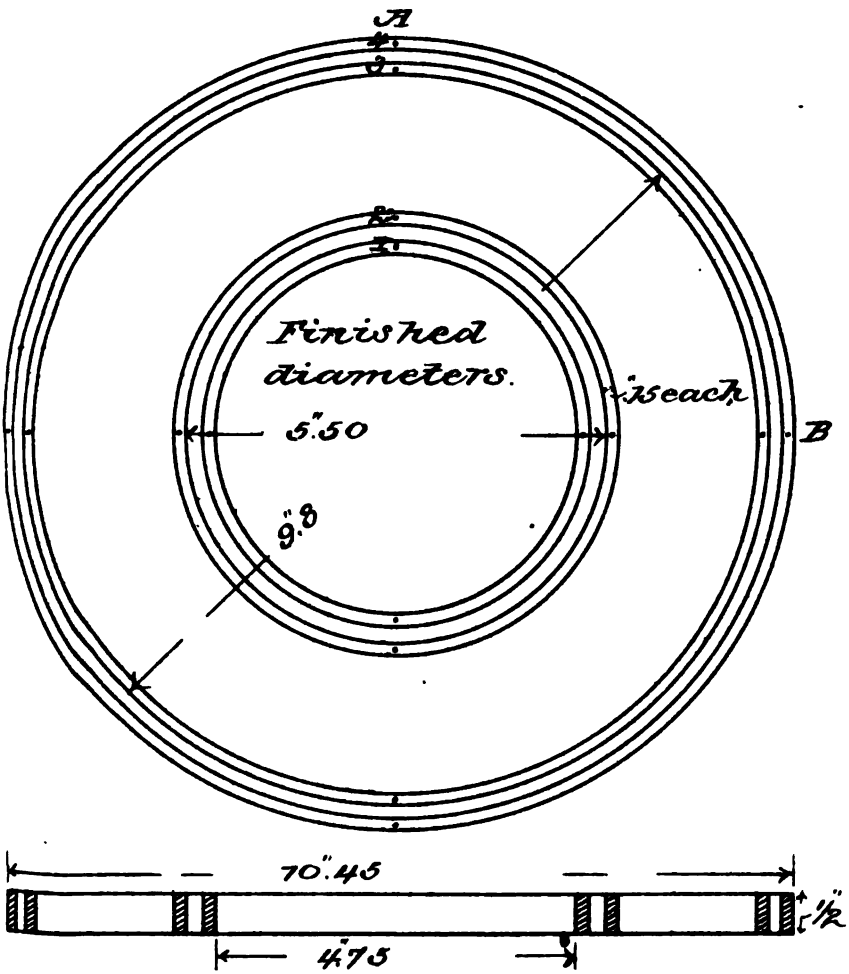
SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0049 | +.0040 | +.00445 |
| 3 detached | −.0039 | −.0043 | −.0041 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0061 | +.0035 | +.0043 |
| 3 detached | −.0083 | −.0043 | −.0088 |

6-inch R.F. Gun Tube.
Marks 11,837 $B_1$
Breech Slice.



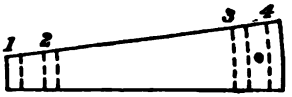
## No. 11837 $B_1$.

### Breech Slice.

State of internal strains and stresses at different phases of the slice.

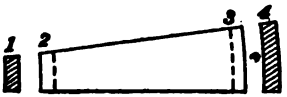
SLICE INTACT.

Interior diameter of slice, 4″.75. Exterior diameter, 10″.45.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inch.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.90115 | ..... | .0055 | ..... | 38,700 |
| 2 | 5.65015 | ..... | .00215 | ..... | 11,400 |
| 3 | 9.63685 | .00205 | ..... | 6,400 | ..... |
| 4 | 10.3050 | ..... | .00115 | ..... | 3,300 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 5″.50. Exterior diameter, 9″.8.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.90665 | ..... | ..... | ..... | ..... |
| 2 | 5.64855 | ..... | .00375 | ..... | 19,900 |
| 3 | 9.63585 | .00105 | ..... | 3,300 | ..... |
| 4 detached | 10.30615 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.6523 | ..... | ..... | ..... | ..... |
| 3 detached | 9.6348 | ..... | ..... | ..... | ..... |

## Breech Slice.

Interior diameter, 4″.75. Exterior diameter, 10″.45.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9089 | 4.8984 | 4.90115 |
| 2 | 5.6492 | 5.6511 | 5.65015 |
| 3 | 9.6367 | 9.6370 | 9.63685 |
| 4 | 10.3045 | 10.3055 | 10.3050 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.9095 | 4.9038 | 4.90665 |
| 2 | 5.6472 | 5.6499 | 5.64855 |
| 3 | 9.6356 | 9.6361 | 9.63585 |
| 4 detached | 10.3104 | 10.3019 | 10.30615 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6508 | 5.6538 | 5.6523 |
| 3 detached | 9.6342 | 9.6354 | 9.6348 |

Breech strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0056 | +.0054 | +.0055 |
| 2 in slice | −.0020 | −.0012 | −.0016 |
| 3 in slice | −.0011 | −.0009 | −.0010 |
| 4 detached | +.0059 | −.0036 | +.00115 |

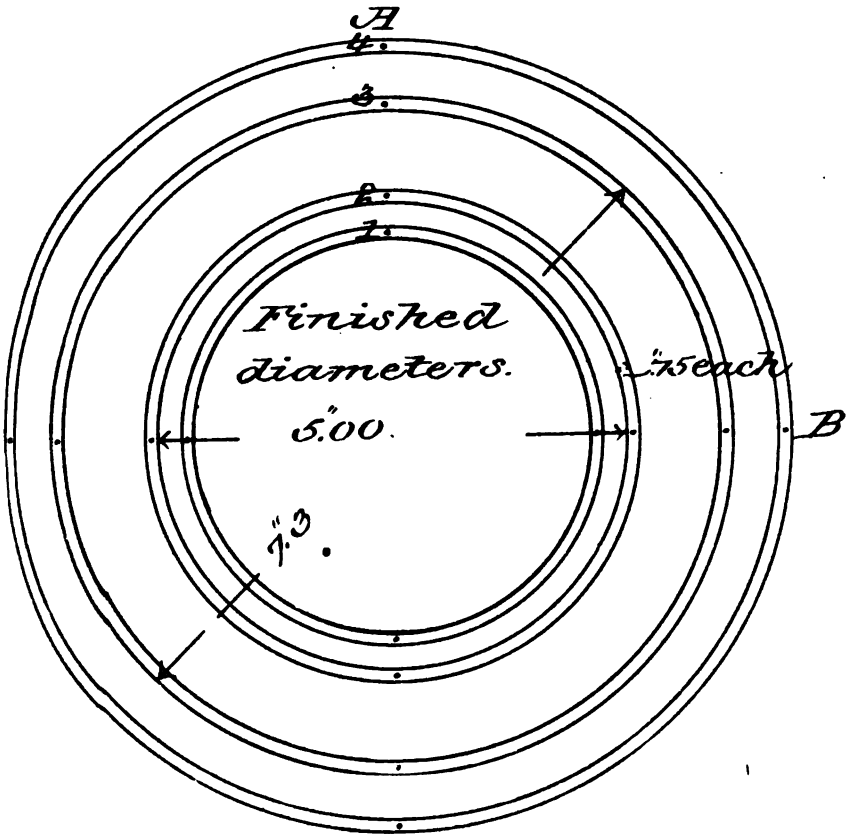
SECOND TO THIRD PHASE.

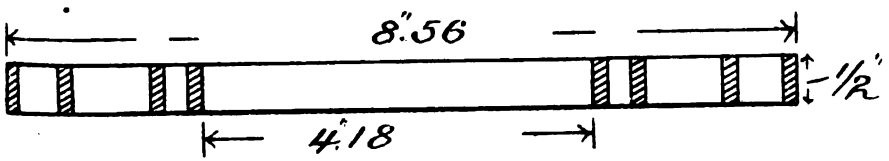
| | | | |
|---|---|---|---|
| 2 detached | +.0036 | +.0039 | +.00375 |
| 3 detached | −.0014 | −.0007 | −.00105 |

FIRST TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0016 | +.0027 | +.00215 |
| 3 detached | −.0025 | −.0016 | −.00205 |

# 5-inch R.F. Gun Tube.
## Marks 11,837 B1
## Muzzle Slice.



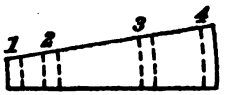
## No. 11837 $B_1$.

### Muzzle Slice.

State of internal strains and stresses at different phases of the slice.

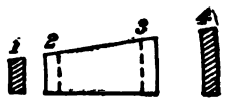
SLICE INTACT.

Interior diameter of slice, 4″.18. Exterior diameter, 8″.56.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.3474 | ..... | .0043 | ..... | 29,600 |
| 2 | 5.15225 | .0003 | ..... | 1,700 | ..... |
| 3 | 7.1417 | .0014 | ..... | 5,900 | ..... |
| 4 | 8.3961 | .0003 | ..... | 1,100 | ..... |

Rings 1 and 4, detached; rings 2 and 3, in the slice.
Interior diameter of slice, 5″.00. Exterior diameter, 7″.3.




| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 4.3517 | ..... | ..... | ..... | ..... |
| 2 | 5.15065 | ..... | .0013 | ..... | 7,600 |
| 3 | 7.14045 | .00015 | ..... | 600 | ..... |
| 4 detached | 8.3958 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.15195 | ..... | ..... | ..... | ..... |
| 3 detached | 7.1403 | ..... | ..... | ..... | ..... |

## Muzzle Slice.

Interior diameter, 4″.18. Exterior diameter, 8″.56.
Original diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.3477 | 4.3471 | 4.3474 |
| 2 | 5.1505 | 5.1540 | 5.15225 |
| 3 | 7.1425 | 7.1409 | 7.1417 |
| 4 | 8.3946 | 8.3976 | 8.3961 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 4.3521 | 4.3513 | 4.3517 |
| 2 | 5.1486 | 5.1527 | 5.15065 |
| 3 | 7.1410 | 7.1399 | 7.14045 |
| 4 detached | 8.4047 | 8.3869 | 8.3958 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.1497 | 5.1542 | 5.15195 |
| 3 detached | 7.1402 | 7.1404 | 7.1403 |

Muzzle strains released.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inch.* | *Inch.* | *Inch.* |
| 1 detached | +.0044 | +.0042 | +.0043 |
| 2 in slice | −.0019 | −.0013 | −.0016 |
| 3 in slice | −.0015 | −.0010 | −.00125 |
| 4 detached | +.0101 | −.0107 | −.0003 |

SECOND TO THIRD PHASE.

| | | | |
|---|---|---|---|
| 2 detached | +.0011 | +.0015 | +.0013 |
| 3 detached | −.0008 | +.0005 | −.00015 |

FIRST TO THIRD PHASE.

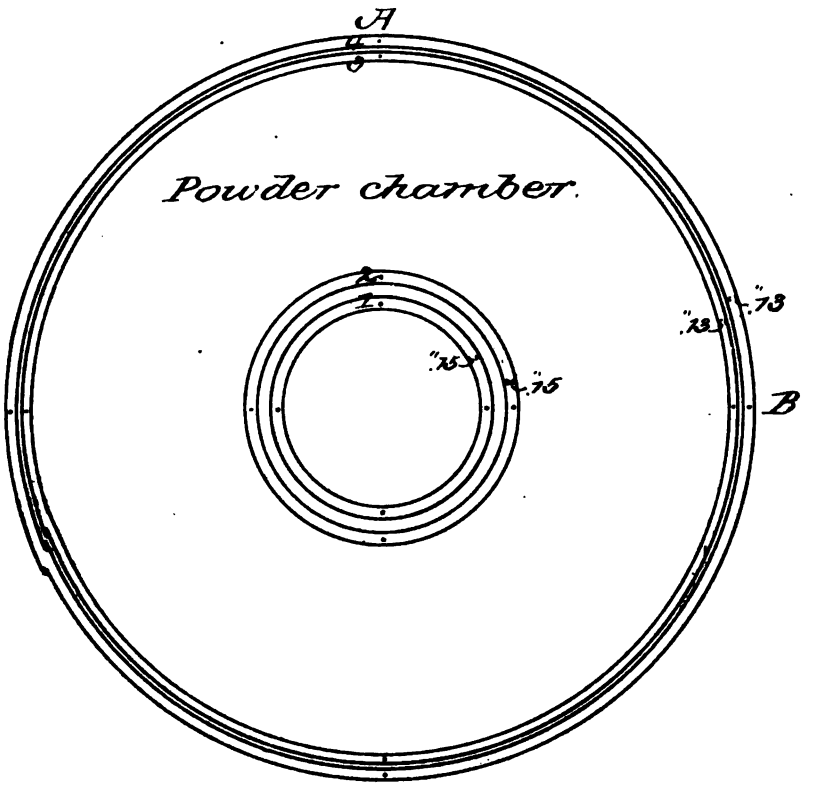
| | | | |
|---|---|---|---|
| 2 detached | −.0008 | +.0002 | −.0003 |
| 3 detached | −.0023 | −.0005 | −.0014 |

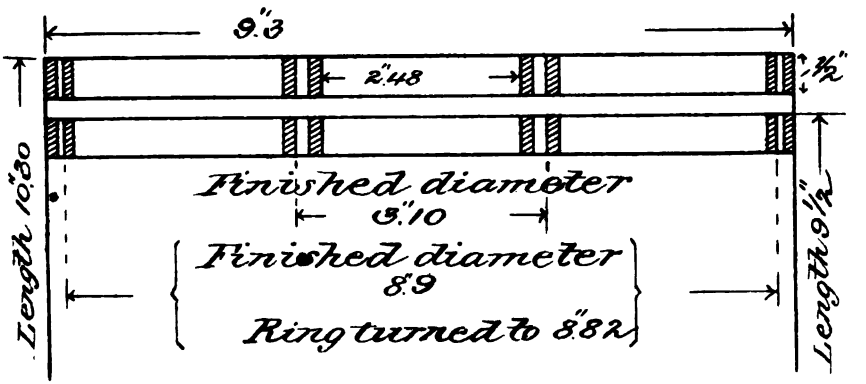
# INTERNAL STRAINS

IN

## SURPLUS METAL FROM ENDS OF 3-INCH SINGLE FORGING GUN.

# 3-inch Single Forging Gun.
## Surplus metal from breech end



Forgings shipped from the Bethlehem Iron Company about March 24, 1898, to Watervliet Arsenal. Samples forwarded to Watertown Arsenal from Watervliet Arsenal.

## Breech End.

Interior diameter, 2″.48. Exterior diameter, 9″.3.
Measurements taken while the 10″.30 section was intact.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6410 | 2.6415 | 2.64125 |
| 2 | 3.2485 | 3.2496 | 3.24905 |
| 3 | 8.6843 | 8.6804 | 8.68235 |
| 4 | 9.1435 | 9.1442 | 9.14385 |

Slice ½″ long cut off the 10″.30 section and diameters remeasured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6376 | 2.6380 | 2.6378 |
| 2 | 3.2450 | 3.2463 | 3.24565 |
| 3 | 8.6818 | 8.6780 | 8.6799 |
| 4 | 9.1412 | 9.1416 | 9.1414 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 2.6412 | 2.6421 | 2.64165 |
| 2 | 3.2437 | 3.2454 | 3.24455 |
| 3 | 8.6815 | 8.6777 | 8.6796 |
| 4 detached | 9.1368 | 9.1399 | 9.13835 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.2477 | 3.2489 | 3.2483 |
| 3 detached | 8.6781 | 8.6748 | 8.67645 |

## Breech End.

State of internal strains and stresses in the 10″.30 section and in the detached slice.

Section 10″.30 long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.64125 | | .0004 | | 4,500 |
| 2 | 3.24905 | .00075 | | 6,900 | |
| 2 | 8.68235 | .0059 | | 20,300 | |
| 4 | 9.14385 | .00545 | | 17,900 | |

Slice ½″ long cut off the 10″.30 section and diameters remeasured.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6378 | | .00385 | | 43,900 |
| 2 | 3.24565 | | .00265 | | 24,500 |
| 3 | 8.6799 | .00345 | | 11,900 | |
| 4 | 9.1414 | .00805 | | 10,000 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 3″.10. Exterior diameter, 8″.82.

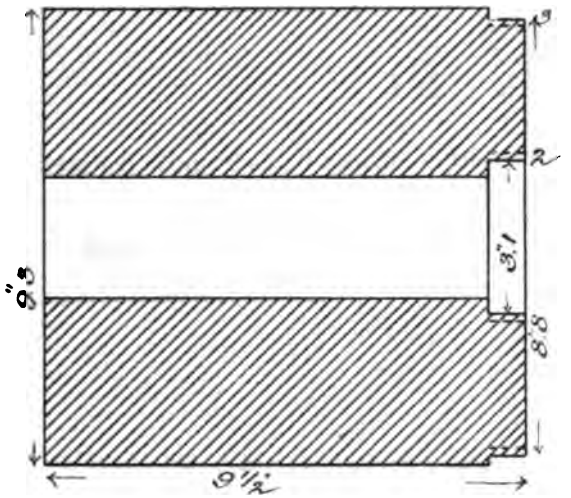
| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 2.64165 | | | | |
| 2 | 3.24455 | | .00375 | | 34,600 |
| 3 | 8.6796 | .00315 | | 10,900 | |
| 4 detached | 9.13835 | | | | |

RINGS ALL DETACHED.

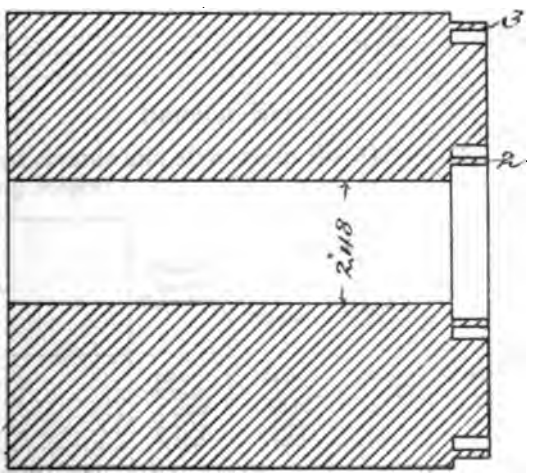
| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.2483 | | | | |
| 3 detached | 8.67645 | | | | |

*Breech end.*

*Rings 1 and 4 detached,*
*rings 2 and 3 on end of piece.*




*Cuts detaching sides of rings 2 and 3,*
*ends of rings still attached to piece.*



## BREECH END.

Second series of experiments on end of piece, now 9½" long. Measurements on end of reduced section.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6210 | 2.6160 | 2.6185 |
| 2 | 3.2351 | 3.2308 | 3.23295 |
| 3 | 8.6750 | 8.6680 | 8.6715 |
| 4 | 9.1739 | 9.1709 | 9.1724 |

Rings 1 and 4 detached; rings 2 and 3 remain on the end of piece.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 2.6215 | 2.6160 | 2.61875 |
| 2 | 3.2348 | 3.2304 | 3.2326 |
| 3 | 8.6755 | 8.6683 | 8.6719 |
| 4 detached | 9.1713 | 9.1685 | 9.1674 |

Cuts detaching sides of rings 2 and 3, ends of rings still attached to piece.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 sides detached | 3.2355 | 3.2307 | 3.2331 |
| 3 sides detached | 8.6723 | 8.6659 | 8.6691 |

ALL RINGS WHOLLY DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.2347 | 3.2301 | 3.2324 |
| 3 detached | 8.6692 | 8.6622 | 8.6657 |

## BREECH END.

State of internal strains and stresses in the 9½" section. Section 9½" long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6185 | ..... | .00025 | ..... | 2,900 |
| 2 | 3.23295 | .00055 | ..... | 5,100 | ..... |
| 3 | 8.6715 | .0068 | ..... | 20,100 | ..... |
| 4 | 9.1724 | .0050 | ..... | 16,300 | ..... |

Rings 1 and 4 detached; rings 2 and 3 remain on the end of piece.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 2.61875 | | | | |
| 2 on end of piece | 3.2826 | .0002 | | 1,800 | |
| 3 on end of piece | 8.6719 | .0062 | | 21,400 | |
| 4 detached | 9.1674 | | | | |

Cuts detaching sides of rings 2 and 3; ends of rings still attached to piece.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 sides detached | 3.2331 | .0007 | | 6,500 | |
| 3 sides detached | 8.6691 | .0034 | | 11,700 | |

ALL RINGS WHOLLY DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.2824 | | | | |
| 3 detached | 8.6657 | | | | |

## Breech End.

A slice taken from remaining part of the piece.

This slice was heated to a full red and cooled slowly in dry sawdust covered with sand.

Rings 1 and 2 laid off and measured after the above annealing.

Annealed for the purpose of eliminating initial strains.

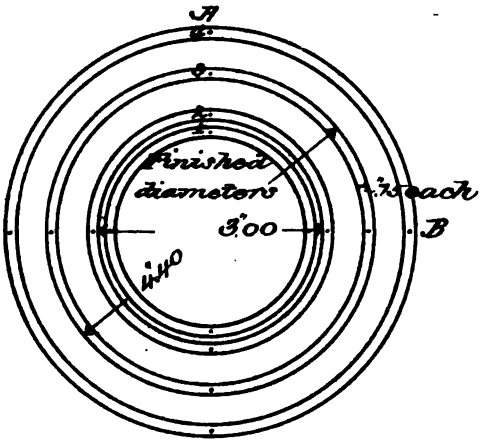
RINGS IN THE SLICE.

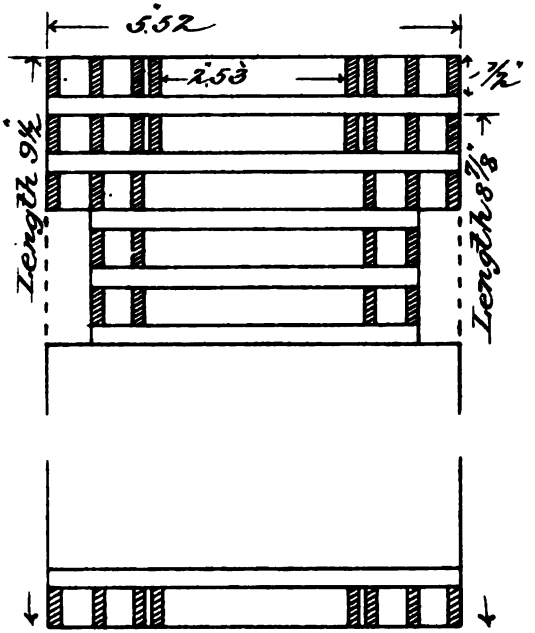
| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6230 | 2.6142 | 2.6186 |
| 2 | 3.2594 | 3.2625 | 3.25595 |

RINGS DETACHED.

| | | | |
|---|---|---|---|
| 1 detached | 2.6229 | 2.6142 | 2.61855 |
| 2 detached | 3.2596 | 3.2625 | 3.25605 |

3-inch Single Forging Gun.
Surplus metal from muzzle end.



## MUZZLE END.

Measurements taken while the 9½″ section was intact.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6775 | 2.6777 | 2.6776 |
| 2 | 3.1381 | 3.1487 | 3.1434 |
| 3 | 4.2525 | 4.2505 | 4.2515 |
| 4 | 5.3537 | 5.3612 | 5.35745 |

Slice ½″ long cut off 9½″ section and diameters remeasured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6758 | 2.6757 | 2.6755 |
| 2 | 3.1362 | 3.1467 | 3.14145 |
| 3 | 4.2509 | 4.2488 | 4.24985 |
| 4 | 5.3521 | 5.3592 | 5.35565 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 2.6779 | 2.6779 | 2.6779 |
| 2 | 3.1356 | 3.1465 | 3.14105 |
| 3 | 4.2511 | 4.2492 | 4.25015 |
| 4 detached | 5.3584 | 5.3567 | 5.35505 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.1369 | 3.1475 | 3.1422 |
| 3 detached | 4.2500 | 4.2480 | 4.2490 |

## MUZZLE END.

State of internal strains and stresses in the 9½″ section and in the detached slice.

Section 9½″ long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6776 | | .0003 | | 3,400 |
| 2 | 3.1434 | .0012 | | 11,500 | |
| 3 | 4.2515 | .0025 | | 17,600 | |
| 4 | 5.35745 | .0024 | | 13,400 | |

Slice ½″ long cut off the 9½″ section and diameters remeasured.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds* | *Pounds.* |
| 1 | 2.6755 | | .0024 | | 26,900 |
| 2 | 3.14145 | | .00075 | | 7,200 |
| 3 | 4.24985 | .00085 | | 6,000 | |
| 4 | 5.35565 | .0006 | | 3,400 | |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameter of slice, 3″. Exterior diameter, 4″.40.

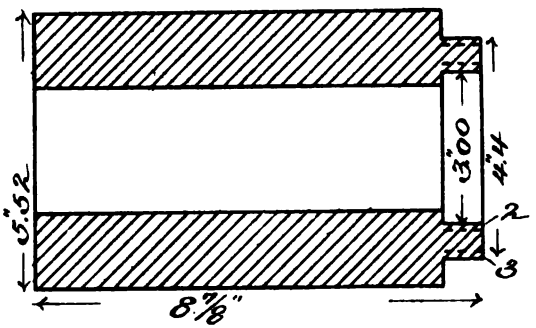
| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 2.6779 | | | | |
| 2 | 3.14105 | | .00115 | | 11,000 |
| 3 | 4.25015 | .00115 | | 8,100 | |
| 4 detached | 5.35505 | | | | |

RINGS ALL DETACHED.

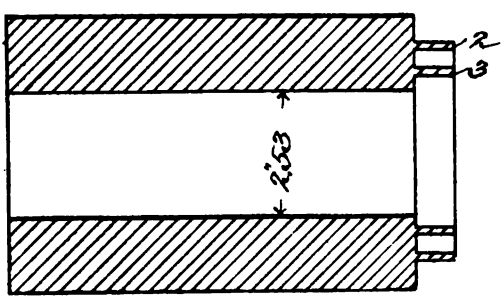
| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.1422 | | | | |
| 3 detached | 4.2490 | | | | |

Muzzle end.

Rings 1 and 4 detached,
rings 2 and 3 on end of piece




Metal between rings 2 and 3 removed
ends of rings still attached to piece.



## MUZZLE END.

Second series of observations on end of piece, now $8\frac{7}{8}$" long.

Measurements on end of reduced section.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6902 | 2.6974 | 2.6938 |
| 2 | 3.1457 | 3.1415 | 3.1436 |
| 3 | 4.2445 | 4.2476 | 4.24605 |
| 4 | 5.3616 | 5.3581 | 5.35985 |

Rings 1 and 4 detached; rings 2 and 3 remain on the end of piece.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 2.6908 | 2.6976 | 2.6942 |
| 2 on end of piece | 3.1457 | 3.1418 | 3.14375 |
| 3 on end of piece | 4.2452 | 4.2482 | 4.2467 |
| 4 detached | 5.3589 | 5.3519 | 5.3554 |

Metal between rings 2 and 3 removed; rings still attached to end of piece.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 sides detached | 3.1452 | 3.1413 | 3.14325 |
| 3 sides detached | 4.2429 | 4.2459 | 4.2444 |

ALL RINGS WHOLLY DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.1441 | 3.1401 | 3.1421 |
| 3 detached | 4.2417 | 4.2447 | 4.2432 |

## MUZZLE END.

State of internal strains and stresses in the $8\frac{1}{8}$" section.
Section $8\frac{1}{8}$" long.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6938 | ..... | .0004 | ..... | 4,400 |
| 2 | 3.1436 | .0015 | ..... | 14,300 | ..... |
| 3 | 4.24605 | .00285 | ..... | 20,100 | ..... |
| 4 | 5.35985 | .00445 | ..... | 24,900 | ..... |

Rings 1 and 4 detached; rings 2 and 3 remain on the end of piece.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 2.6942 | ..... | ..... | ..... | ..... |
| 2 on end of piece | 3.14375 | .00165 | ..... | 15,700 | ..... |
| 3 on end of piece | 4.2467 | .0035 | ..... | 24,700 | ..... |
| 4 detached | 5.3554 | ..... | ..... | ..... | ..... |

Metal between rings 2 and 3 removed; rings still attached to end of piece.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 sides detached | 3.14325 | .00115 | ..... | 11,000 | ..... |
| 3 sides detached | 4.2444 | .0012 | ..... | 8,400 | ..... |

ALL RINGS WHOLLY DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.1421 | ..... | ..... | ..... | ..... |
| 3 detached | 4.2432 | ..... | ..... | ..... | ..... |

## MUZZLE END.

Measurements taken on opposite end of the piece, the present length of which is 7″.75.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6995 | 2.7001 | 2.6998 |
| 2 | 3.1583 | 3.1600 | 3.15915 |
| 3 | 4.2350 | 4.2410 | 4.2380 |
| 4 | 5.3734 | 5.3722 | 5.3728 |

Slice ¼″ long cut off end of piece and diameters remeasured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6971 | 2.6977 | 2.6974 |
| 2 | 3.1568 | 3.1577 | 3.15675 |
| 3 | 4.2828 | 4.2387 | 4.28575 |
| 4 | 5.3716 | 5.3702 | 5.3709 |

Slice reduced to ¼″ in length and diameters again measured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 2.6974 | 2.6976 | 2.6975 |
| 2 | 3.1561 | 3.1576 | 3.15685 |
| 3 | 4.2383 | 4.2393 | 4.2363 |
| 4 | 5.3718 | 5.3701 | 5.37095 |

Rings 1 and 4 detached; rings 2 and 3 in the slice.
Interior diameters of slice, 3″.00. Exterior diameter, 4″.40.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 2.6991 | 2.7006 | 2.69985 |
| 2 | 3.1569 | 3.1575 | 3.1567 |
| 3 | 4.2380 | 4.2391 | 4.23605 |
| 4 detached[1] | 5.3740 | 5.3706 | 5.3723 |

[1] Approximate diameters. Instability of shape attributed to conflicting internal strains.

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.1567 | 3.1581 | 3.1574 |
| 3 detached | 4.2825 | 4.2887 | 4.2856 |

## MUZZLE END.

State of internal strains and stresses in opposite end of section 7".75 long, and in detached slice.

Section 7".75 long.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6998 | ..... | .00005 | ..... | 500 |
| 2 | 3.15915 | .00175 | ..... | 16,600 | ..... |
| 3 | 4.2380 | .0024 | ..... | 17,000 | ..... |
| 4 | 5.3728 | .0006 | ..... | 2,800 | ..... |

Slice ¼" long cut off end of piece.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6974 | ..... | .00245 | ..... | 27,200 |
| 2 | 3.15675 | ..... | .00065 | ..... | 6,200 |
| 3 | 4.23575 | .00015 | ..... | 1,100 | ..... |
| 4 | 5.3709 | ..... | .0014 | ..... | 7,800 |

Slice reduced to ¼" length.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 2.6975 | ..... | .00235 | ..... | 26,100 |
| 2 | 3.15685 | ..... | .00055 | ..... | 5,200 |
| 3 | 4.2363 | .0007 | ..... | 4,900 | ..... |
| 4 | 5.37095 | ..... | .00135 | ..... | 7,500 |

Rings 1 and 4 detached, rings 2 and 3 in the slice.
Interior diameter of slice, 3".00. Exterior diameter, 4".40.

| Rings. | Present. mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 2.69985 | ..... | ..... | ..... | ..... |
| 2 | 3.1567 | ..... | .0007 | ..... | 6,600 |
| 3 | 4.23606 | .00045 | ..... | 3,200 | ..... |
| 4 detached | 5.3723 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.1574 | ..... | ..... | ..... | ..... |
| 3 detached | 4.2356 | ..... | ..... | ..... | ..... |

## MUZZLE END.

Measurements taken on first end of piece. Exterior cylindrical surface of piece not turned. Surface of bore, bored out to finished dimensions of the gun, 3".00.

Present length of piece, 6¾".

Measurements taken on first end of piece.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 | 3.1471 | 3.1521 | 3.1496 |
| 3 | 4.2465 | 4.2485 | 4.2475 |
| 4 | 5.3582 | 5.3592 | 5.3587 |

Slice ½" long cut off end of piece and diameters remeasured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 | 3.1458 | 3.1492 | 3.1475 |
| 3 | 4.2459 | 4.2471 | 4.24625 |
| 4 | 5.3571 | 5.3579 | 5.3575 |

Ring 4 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches* | *Inches.* |
| 2 | 3.1466 | 3.1516 | 3.1491 |
| 3 | 4.2465 | 4.2481 | 4.2473 |
| 4 detached | 5.3559 | 5.3559 | 5.3559 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.1476 | 3.1527 | 3.15015 |
| 3 detached | 4.2452 | 4.2468 | 4.2460 |

## MUZZLE END.

State of internal strains and stresses in first end of section $6\frac{3}{4}$" long, with surface of bore turned to finished dimensions of gun. and in detached slice.

Section $6\frac{3}{4}$" long.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.1496 | ..... | .00055 | ..... | 5,200 |
| 3 | 4.2475 | .0015 | ..... | 10,600 | ..... |
| 4 | 5.3587 | .0028 | ..... | 15,700 | ..... |

Slice $\frac{1}{2}$" long cut off end of piece, and diameters remeasured.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.1475 | ..... | .00265 | ..... | 25,200 |
| 3 | 4.24625 | .00025 | ..... | 1,800 | ..... |
| 4 | 5.3575 | .0016 | ..... | 9,000 | ..... |

Ring 4 detached; rings 2 and 3 in the slice.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.1491 | ..... | .00105 | ..... | 10,000 |
| 3 | 4.2473 | .0018 | ..... | 9,200 | ..... |
| 4 detached | 5.3559 | ..... | ..... | ..... | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.15015 | ..... | ..... | ..... | ..... |
| 3 detached | 4.2460 | ..... | ..... | ..... | ..... |

## MUZZLE END.

Piece brought to the finished dimensions of muzzle of gun.

Present length of piece 6″. Interior diameter, 3″. Exterior diameter 4″.40.

Measurements taken on end of piece 6″ long.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 | 3.1523 | 3.1456 | 3.14895 |
| 3 | 4.2684 | 4.2576 | 4.2630 |

Slice ½″ long cut off end of piece, and diameters remeasured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 | 3.1515 | 3.1447 | 3.1481 |
| 3 | 4.2677 | 4.2568 | 4.26225 |

RINGS DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 3.1524 | 3.1453 | 3.14885 |
| 3 detached | 4.2663 | 4.2556 | 4.26095 |

## MUZZLE END.

State of internal strains and stresses in end of 6″ section and in detached slice.

End of 6″ section.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.14895 | .0001 | ..... | 1,000 | ..... |
| 3 | 4.2630 | .00205 | ..... | 14,400 | ..... |

Slice ½″ long cut off end of piece and diameters remeasured.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.1481 | ..... | .00075 | ..... | 7,100 |
| 3 | 4.26225 | .0013 | ..... | 9,100 | ..... |
| RINGS DETACHED. | | | | | |
| 2 detached | 3.14885 | ..... | ..... | ..... | ..... |
| 3 detached | 4.26095 | ..... | ..... | ..... | ..... |

## Muzzle End.

Piece 5″.3 long of finished diameters of gun at the muzzle, annealed by heating to a full red and cooling in dry sawdust covered with dry sand.

Measurements taken on end of annealed piece 5″.3 long.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 | 3.1488 | 3.1504 | 3.1496 |
| 3 | 4.2596 | 4.2614 | 4.2605 |

Slice ½″ long cut off end of piece, and diameters remeasured.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 2 | 3.1489 | 3.1504 | 3.14965 |
| 3 | 4.2596 | 4.2613 | 4.26045 |
| RINGS DETACHED. | | | |
| 2 detached | 3.1490 | 3.1504 | 3.1497 |
| 3 detached | 4.2596 | 4.2612 | 4.2604 |

Rings cut apart radially. No springing of ends.

## MUZZLE END.

State of internal strains and stresses in end of annealed piece 5".3 long, and in detached slice.

End of 5".3 section.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.1496 | | .0001 | | 1,000 |
| 3 | 4.2605 | .0001 | | 700 | |

Slice $\frac{1}{4}$" long cut off end of piece, and diameters remeasured.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 2 | 3.14965 | | .00005 | | 500 |
| 3 | 4.26045 | .00005 | | 300 | |

RINGS DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 3.1497 | | | | |
| 3 detached | 4.2604 | | | | |

# INTERNAL STRAINS

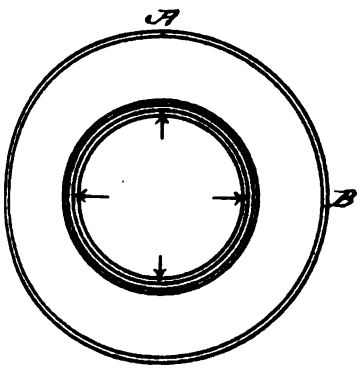
IN

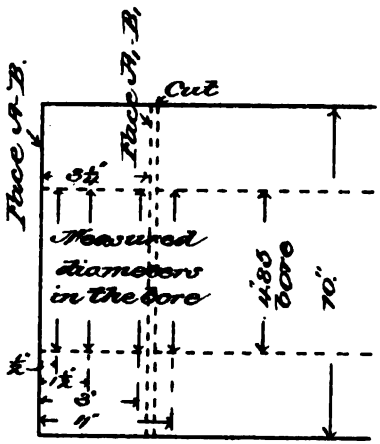
## SURPLUS METAL FROM ENDS OF 5-INCH R. F. GUN TUBE.

6-inch R.F. Gun Tube.

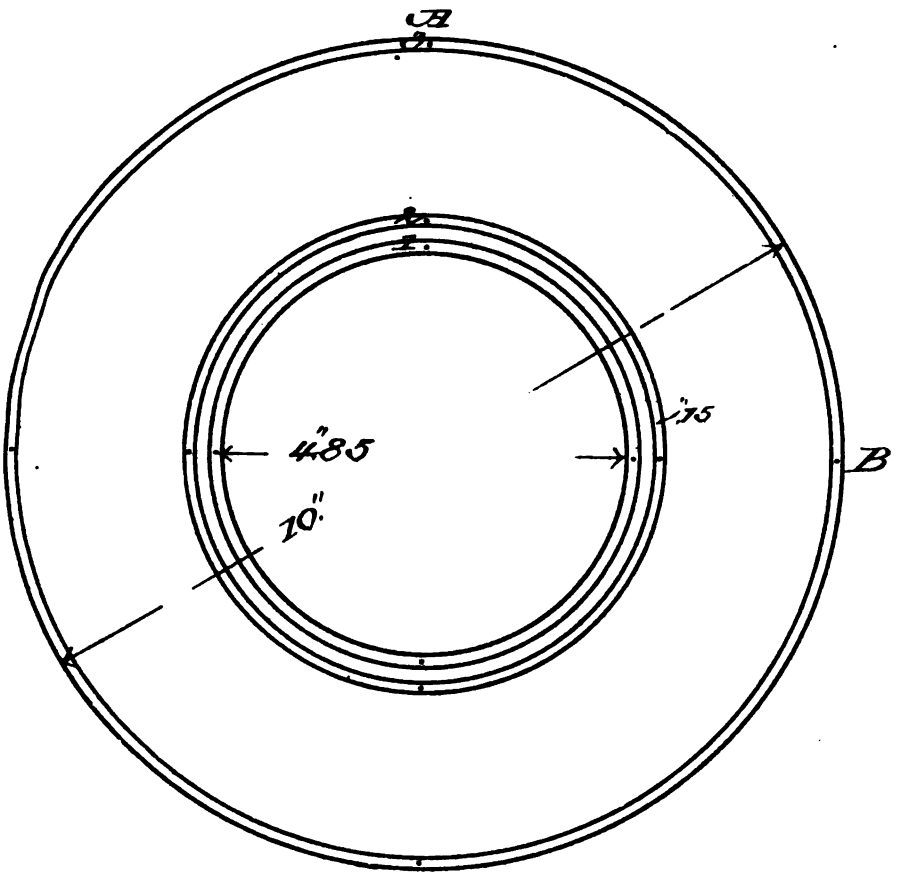
Surplus metal at ends.

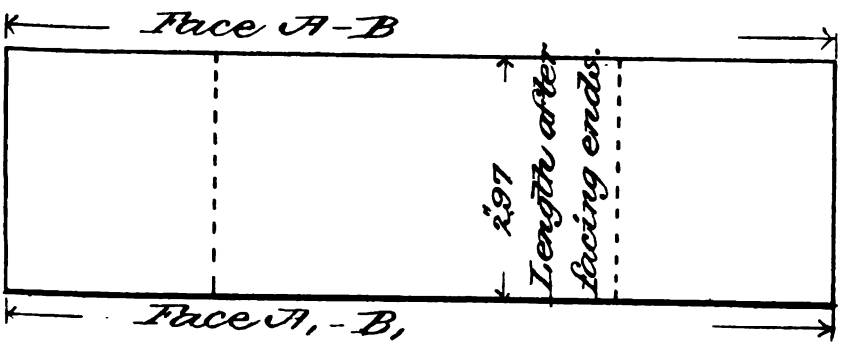
Breech end.



# 5-inch R.F. Gun Tube.
## Breech section.



## Breech Section. Face A–B.

Section intact.
Surface diameters.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0092 | 5.0065 | 5.00785 |
| 2 | 5.6464 | 5.6534 | 5.6499 |
| 3 | 9.8454 | 9.8462 | 9.8458 |

Slice ½″ long detached from face A–B.
Surface diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0076 | 5.0049 | 5.00625 |
| 2 | 5.6450 | 5.6521 | 5.64855 |
| 3 | 9.8446 | 9.8455 | 9.84505 |

Ring 1 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 5.0126 | 5.0127 | 5.01265 |
| 2 | 5.6433 | 5.6505 | 5.6469 |
| 3 | 9.8434 | 9.8442 | 9.8438 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6474 | 5.6540 | 5.6507 |
| 3 detached | 9.8397 | 9.8445 | 9.8421 |

## Breech Section. Face A–B.

State of internal strains and stresses during the successive changes in the state of the metal.
Section 2″.97 long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.00785 | ..... | .0048 | ..... | 28,700 |
| 2 | 5.6499 | ..... | .0008 | ..... | 4,200 |
| 3 | 9.8458 | .0037 | ..... | 11,800 | ..... |

Slice ½″ long detached from face A–B.

| Rings. | Present mean diameters. | Strains. | | Stresses. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.00625 | ..... | .0064 | ..... | 38,300 |
| 2 | 5.64855 | ..... | .00215 | ..... | 11,400 |
| 3 | 9.84506 | .00295 | ..... | 9,000 | ..... |

Ring 1 detached; rings 2 and 3 in the slice.

| Rings. | Present mean diameters. | Strains. | | Stresses. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 5.01265 | ..... | ..... | ..... | ..... |
| 2 | 5.6469 | ..... | .0068 | ..... | 20,200 |
| 3 | 9.8438 | .0017 | ..... | 5,200 | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.6507 | ..... | ..... | ..... | ..... |
| 3 detached | 9.8421 | ..... | ..... | ..... | ..... |

## Breech Section. Face $A_1$–$B_1$.

Section intact.
Surface diameters.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0058 | 5.0070 | 5.00615 |
| 2 | 5.6455 | 5.6415 | 5.6435 |
| 3 | 9.8580 | 9.8584 | 9.8557 |

Slice ½″ long detached from face A–B.
Section remaining 2″.06 long.
Surface diameters measured on face $A_1$–$B_1$.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0048 | 5.0064 | 5.0056 |
| 2 | 5.6450 | 5.6409 | 5.64295 |
| 3 | 9.8578 | 9.8582 | 9.8555 |

Slice ½″ long detached from face $A_1$–$B_1$.
Surface diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0088 | 5.0055 | 5.00465 |
| 2 | 5.6443 | 5.6401 | 5.6422 |
| 3 | 9.8567 | 9.8523 | 9.8545 |

Ring 1 detached; rings 2 and 3 in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 detached | 5.0081 | 5.0115 | 5.0098 |
| 2 | 5.6430 | 5.6389 | 5.64095 |
| 3 | 9.8560 | 9.8517 | 9.8538 |

RINGS ALL DETACHED.

| | | | |
|---|---|---|---|
| 2 detached | 5.6470 | 5.6437 | 5.64535 |
| 3 detached | 9.8505 | 9.8486 | 9.84955 |

## Breech Section. Face $A_1$–$B_1$.

State of internal strains and stresses during the successive changes in the state of the metal.
Section 2″.97 long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.00615 | ..... | .00965 | ..... | 21,900 |
| 2 | 5.6435 | ..... | .00185 | ..... | 9,800 |
| 3 | 9.8557 | .00615 | ..... | 18,700 | ..... |

Slice ½″ long detached from face A–B.
Section remaining 2″.06 long.

| Rings. | Present mean diameters. | Strains. | | Stresses. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.0056 | ..... | .0042 | ..... | 25,200 |
| 2 | 5.64295 | ..... | .0024 | ..... | 12,800 |
| 3 | 9.8555 | .00595 | ..... | 18,100 | ..... |

Slice ½″ long detached from face $A_1$–$B_1$.

DETACHED SLICE.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.00465 | ..... | .00515 | ..... | 30,900 |
| 2 | 5.6422 | ..... | .00815 | ..... | 16,700 |
| 3 | 9.8545 | .00495 | ..... | 15,100 | ..... |

Ring 1 detached; rings 2 and 3 in the slice.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 detached | 5.0098 | ..... | ..... | ..... | ..... |
| 2 | 5.64095 | ..... | .0044 | ..... | 23,400 |
| 3 | 9.85385 | .0043 | ..... | 13,100 | ..... |

RINGS ALL DETACHED.

| | | | | | |
|---|---|---|---|---|---|
| 2 detached | 5.64535 | ..... | ..... | ..... | ..... |
| 3 detached | 9.84956 | ..... | ..... | ..... | ..... |

## MUZZLE SECTION. FACE A–B.

Section intact.
Surface diameters.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9993 | 5.0051 | 5.0022 |
| 2 | 7.9157 | 7.9170 | 7.91635 |

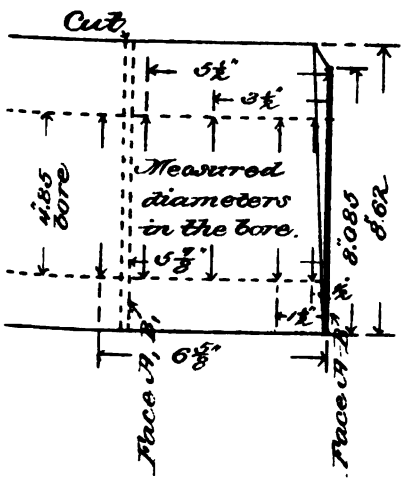
Eccentric metal turned off. Exterior diameter now 8″.075.

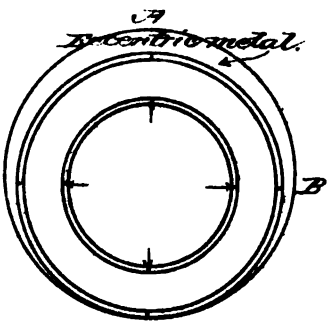
| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0000 | 5.0049 | 5.00245 |
| 2 | 7.9170 | 7.9168 | 7.9169 |

6-inch R.F. Gun Tube.

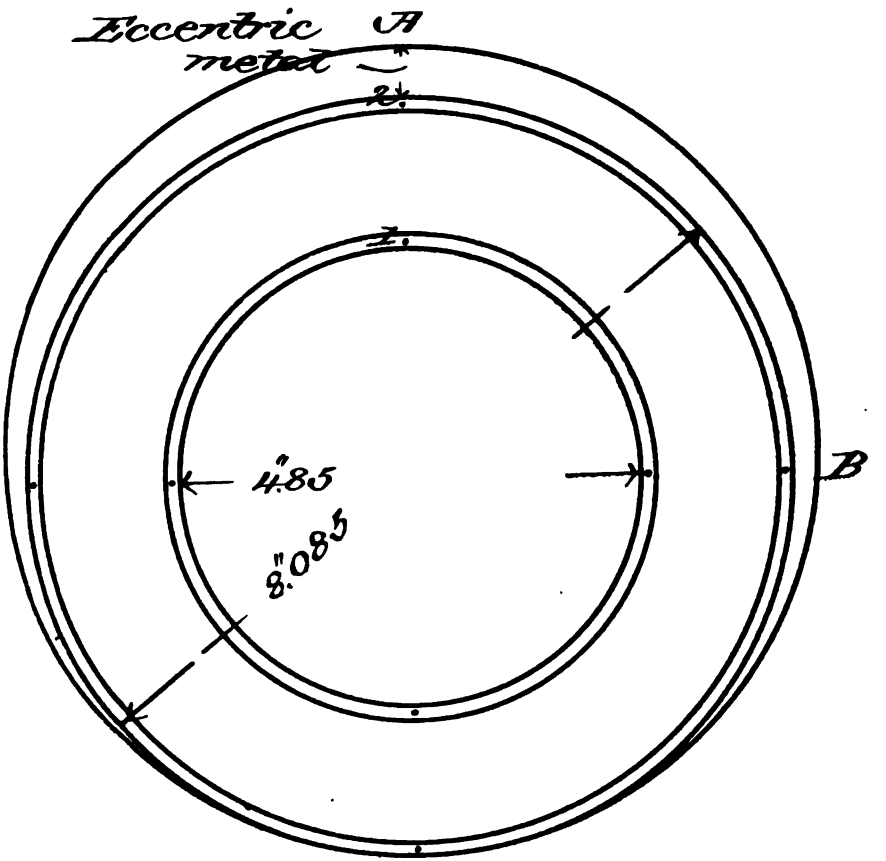
Surplus metal at ends.

Muzzle end



5-inch R. F. Gun Tube.
Muzzle section.




Face A-B.

Slice ½″ long detached from face A–B.
Surface diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 4.9965 | 5.0019 | 4.9992 |
| 2 | 7.9137 | 7.9144 | 7.91405 |
| RINGS DETACHED. | | | |
| 1 detached | 5.0059 | 5.0005 | 5.0032 |
| 2 detached | 7.9102 | 7.9130 | 7.9116 |

## Muzzle Section. Face A–B.

State of internal strains and stresses during the successive changes in the state of the metal.
Section 5″.75 long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.0022 | ..... | .0010 | ..... | 5,900 |
| 2 | 7.91635 | .00475 | ..... | 18,000 | ..... |

Eccentric metal turned off. Exterior diameter now 8″.075.
Section 5.″75 long.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.00245 | ..... | .00075 | ..... | 4,500 |
| 2 | 7.9169 | .0058 | ..... | 20,800 | ..... |

Slice ½″ long, detached from face A–B.
Rings in slice.

RING 1.

| Present diameters. | | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| A | 4.9965 | | .0094 | | 56,400 |
| B | 5.0019 | .0014 | | 8,400 | |
| Mean | | | | | 24,000 |

RING 2.

| | | | | | |
|---|---|---|---|---|---|
| A | 7.9137 | .0035 | | 13,300 | |
| B | 7.9144 | .0014 | | 5,300 | |
| Mean | | | | 9,300 | |

## Muzzle Section. Face $A_1$–$B_1$.

Section intact.
Surface diameters.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0023 | 4.9945 | 4.9984 |
| 2 | 7.9158 | 7.9232 | 7.9195 |

Eccentric metal turned off. Exterior diameter now 8″.075.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0035 | 4.9944 | 4.99895 |
| 2 | 7.9170 | 7.9234 | 7.9202 |

Slice ½″ long detached from face A–B, leaving section 4″.6 long.
Surface diameters measured on face $A_1$–$B_1$.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0032 | 4.9943 | 4.99875 |
| 2 | 7.9165 | 7.9227 | 7.9196 |

Slice ½″ long detached from face $A_1$–$B_1$.
Surface diameters of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.0006 | 4.9912 | 4.9959 |
| 2 | 7.9145 | 7.9201 | 7.9173 |
| RINGS DETACHED. | | | |
| 1 detached | 5.0081 | 4.9920 | 5.00005 |
| 2 detached | 7.9123 | 7.9139 | 7.9131 |

## Muzzle Section. Face $A_1$–$B_1$.

State of internal strains and stresses during the successive changes in the state of the metal.
Section 5″.75 long intact.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.9984 | ..... | .00165 | ..... | 9,900 |
| 2 | 7.9196 | .0064 | ..... | 24,200 | ..... |

Eccentric metal turned off. Exterior diameter now 8″.075.
Section 5″.75 long.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.99895 | ..... | .0011 | ..... | 6,600 |
| 2 | 7.9202 | .0071 | ..... | 26,900 | ..... |

Slice ½″ long detached from face A–B, leaving section 4″.6 long.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 4.99875 | ..... | .0013 | ..... | 7,800 |
| 2 | 7.9196 | .0065 | ..... | 24,600 | ..... |

Slice ½" long detached from face $A_1$–$B_1$.
Rings in slice.

RING 1.

| Present diameters. | | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| A | 5.0006 | | .0075 | | 45,000 |
| B | 4.9912 | | .0008 | | 4,800 |
| Mean | | | | | 24,900 |

RING 2.

| | | | | | |
|---|---|---|---|---|---|
| A | 7.9145 | .0022 | | 8,800 | |
| B | 7.9201 | .0062 | | 23,500 | |
| Mean | | | | 15,900 | |

## Strains Released during the Successive Changes in the State of the Metal.

BREECH END.

Surface diameters. Face A–B.

| | Rings. | Diameters. | | |
|---|---|---|---|---|
| | | A. | B. | Mean |
| | | *Inch.* | *Inch.* | *Inch.* |
| Section 3¼" long removed and faced off to 2".97... | 1, 2, 3 | 0. | 0. | 0. |
| ¼" slice detached from face A–B | 1 | −.0016 | −.0016 | −.0016 |
| | 2 | −.0014 | −.0013 | −.00135 |
| | 3 | −.0008 | −.0007 | −.00075 |
| Ring 1 detached | 1 | +.0050 | +.0078 | +.0064 |
| Rings 2 and 3 in the slice | 2 | −.0017 | −.0016 | −.00165 |
| | 3 | −.0012 | −.0013 | −.00125 |
| Ring 2 detached | 2 | +.0041 | +.0035 | +.0038 |
| Ring 3 detached | 3 | −.0037 | +.0008 | −.0017 |

## STRAINS RELEASED DURING THE SUCCESSIVE CHANGES IN THE STATE OF THE METAL.

### BREECH END.

Surface diameters. Face $A_1$–$B_1$.

| | Rings. | Diameters. A. | B. | Mean. |
|---|---|---|---|---|
| | | *Inch.* | *Inch.* | *Inch.* |
| Section 3¼″ long removed and faced off to 2″.97 | 1, 2, 3 | 0. | 0. | 0. |
| ¼″ slice detached from face A–B, section remaining 2″.06 long | 1 | −.0005 | −.0006 | −.00055 |
| | 2 | −.0005 | −.0006 | −.00055 |
| | 3 | −.0002 | −.0002 | −.0002 |
| ¼″ slice detached from face $A_1$–$B_1$ | 1 | −.0010 | −.0009 | −.00095 |
| | 2 | −.0007 | −.0008 | −.00075 |
| | 3 | −.0011 | −.0009 | −.0010 |
| Ring 1 detached | 1 | +.0043 | +.0060 | +.00515 |
| Rings 2 and 3 in the slice | 2 | −.0013 | −.0012 | −.00125 |
| | 3 | −.0007 | −.0006 | −.00065 |
| Ring 2 detached | 2 | +.0040 | +.0048 | +.0044 |
| Ring 3 detached | 3 | −.0055 | −.0031 | −.0043 |

## STRAINS RELEASED DURING THE SUCCESSIVE CHANGES IN THE STATE OF THE METAL.

### MUZZLE END.

Surface diameters. Face A–B.

| | Rings. | Diameters. A. | B. | Mean. |
|---|---|---|---|---|
| | | *Inch.* | *Inch.* | *Inch.* |
| Section 5¼″ long removed and faced off to 5″.75 | 1, 2 | 0. | 0. | 0. |
| Eccentric metal turned off | 1 | +.0007 | −.0002 | +.00025 |
| Exterior diameter now 8″.075 | 2 | +.0013 | −.0002 | +.00055 |
| ¼″ slice detached from face A–B | 1 | −.0035 | −.0030 | −.00325 |
| | 2 | −.0033 | −.0024 | −.00285 |
| Ring 1 detached | 1 | +.0094 | −.0014 | +.0040 |
| Ring 2 detached | 2 | −.0035 | −.0014 | −.00245 |

## Strains Released During the Successive Changes in the State of the Metal.

### MUZZLE END.

Surface diameters. Face $A_1$–$B_1$.

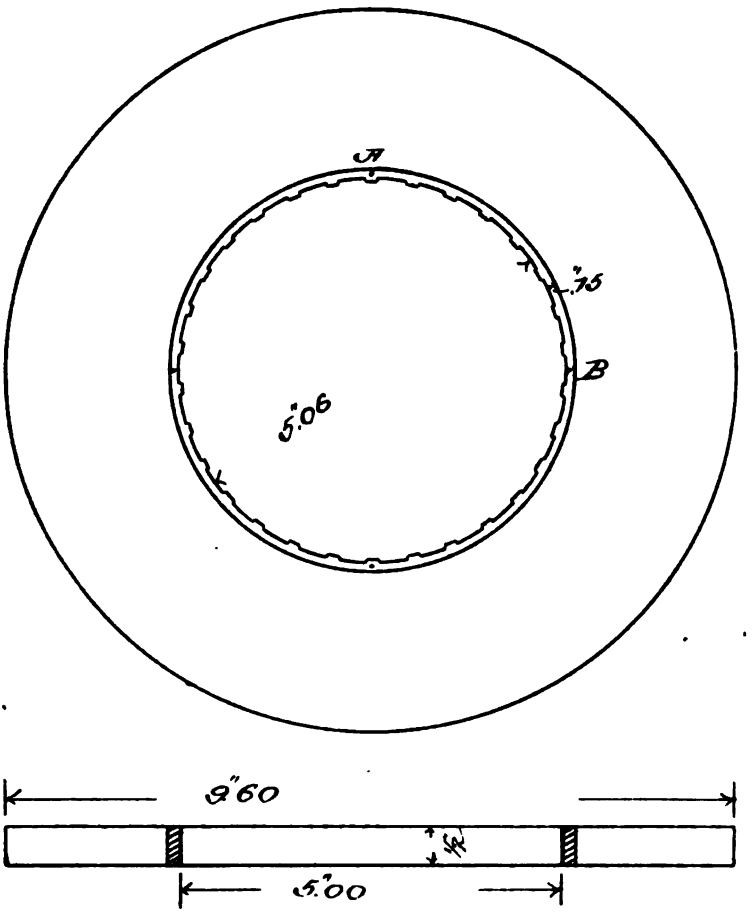
| | Rings. | Diameters. | | |
|---|---|---|---|---|
| | | A. | B. | Mean. |
| | | *Inch.* | *Inch.* | *Inch.* |
| Section 5½″ long removed and faced off to 5″.75.... | 1 | 0. | 0. | 0. |
| | 2 | | | |
| Eccentric metal turned off. Exterior diameter now 8″.075 | 1 | +.0012 | —.0001 | +.00055 |
| | 2 | +.0012 | +.0002 | +.0007 |
| ¼″ slice detached from face A–B, section remaining 4″.6 long | 1 | —.0003 | —.0001 | —.0002 |
| | 2 | —.0005 | —.0007 | —.0006 |
| ¼″ slice detached from face $A_1$–$B_1$ | 1 | —.0026 | —.0031 | —.00285 |
| | 2 | —.0020 | —.0026 | —.0023 |
| Ring 1 detached | 1 | +.0075 | +.0008 | +.00415 |
| Ring 2 detached | 2 | —.0022 | —.0062 | —.0042 |

# INTERNAL STRAINS

IN THE

# TUBE OF A 5-INCH BURST GUN.

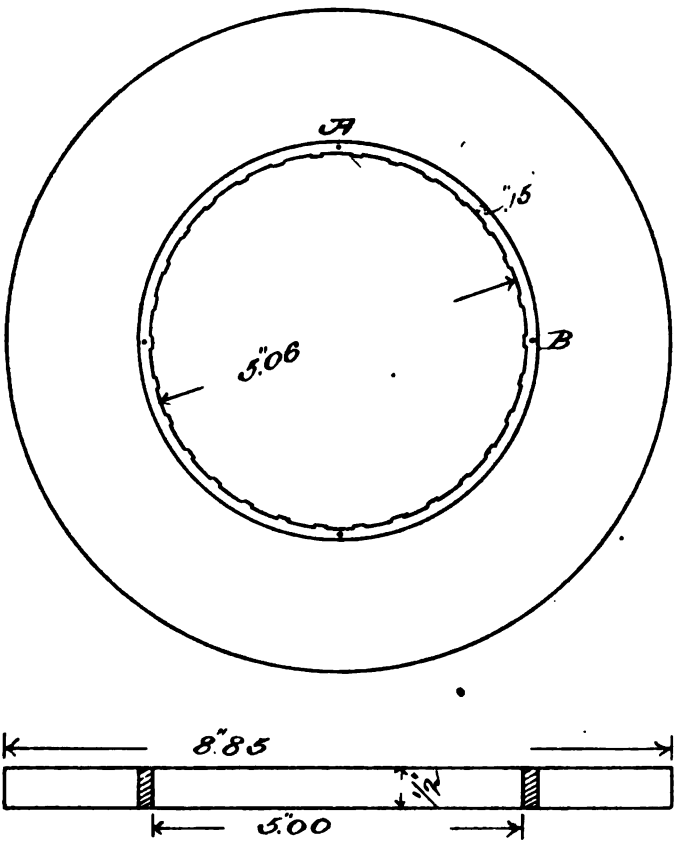
5-inch R.F. Gun No. 1.
Burst gun.
Slice cut from tube, 8ft. from muzzle.



5-inch R. F. Gun No. 1.

Burst gun.

Slice cut from tube, 5ft. from muzzle.



## Slice 8 Feet from Muzzle.

SLICE INTACT.

| Ring. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| 1 | *Inches.* 5.2131 | *Inches.* 5.2155 | *Inches.* 5.2143 |

RING DETACHED.

| | | | |
|---|---|---|---|
| 1 detached | 5.2133 | 5.2119 | 5.2126 |

Ring cut apart radially, whereupon the ends closed in a distance of ".44 measured on a chord of 1".00.

## Slice 5 Feet from Muzzle.

Exterior diameter of slice, 8".85.

SLICE INTACT.

| Ring. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| 1 | *Inches.* 5.2101 | *Inches.* 5.2090 | *Inches.* 5.20955 |

RING DETACHED.

| | | | |
|---|---|---|---|
| 1 detached | 5.2078 | 5.2120 | 5.2099 |

Ring cut apart radially, whereupon the ends closed in ".34 measured on a chord of 1".00.

The ring was straightened and then curved in the reverse direction, bending the ring until it assumed a curvature of 6" radius. Along the junction of one land and a groove on the slack side of the land a fine longitudinal crack developed; otherwise no cracks were visible.

## Slice 3 Feet from Muzzle

Exterior diameter of slice, 7″.76.

SLICE INTACT.

| Ring. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.2123 | 5.2048 | 5.20855 |

RING DETACHED.

| | | | |
|---|---|---|---|
| 1 | 5.2119 | 5.2041 | 5.2080 |

Ring cut apart radially (one cut with a hack saw), whereupon the ends sprung together firmly.

## Slice 4 Inches from Muzzle.

Exterior diameter of slice, 7″.22.

SLICE INTACT.

| Ring. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.2154 | 5.2114 | 5.2134 |

RING DETACHED.

| | | | |
|---|---|---|---|
| 1 | 5.2157 | 5.2101 | 5.2129 |

Ring cut apart radially, whereupon the ends sprung together ″.23. measured on a chord of 1″.00.

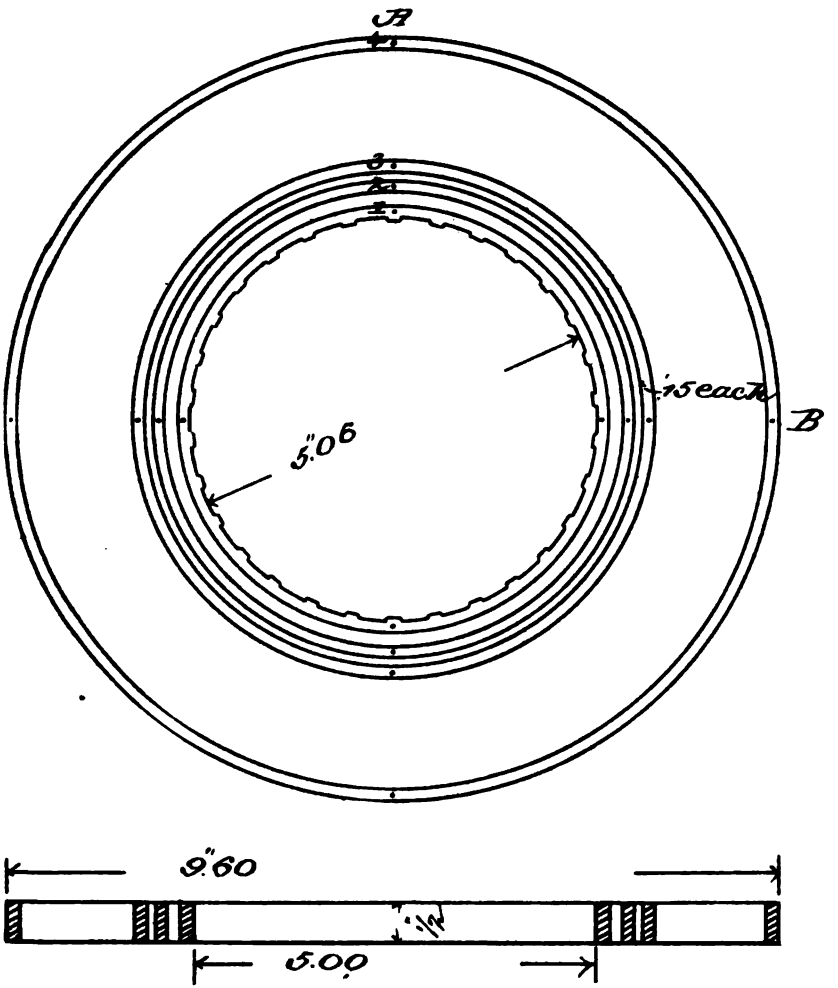
Stresses released by detaching rings 1 from the several slices.

| Distance of slice from muzzle. | Mean diameters, rings 1. | | Difference. | Stresses released. | |
|---|---|---|---|---|---|
| | In slice. | Detached. | | Tension. | Compression. |
| | *Inches.* | *Inches.* | *Inch.* | *Pounds.* | *Pounds.* |
| 8 feet | 5.2143 | 5.2126 | −.0017 | 9,800 | |
| 5 feet | 5.20955 | 5.2099 | +.00035 | | 2,000 |
| 3 feet | 5.20855 | 5.2080 | −.00055 | 3,200 | |
| 4 inches | 5.2134 | 5.2129 | −.0005 | 2,900 | |

5-inch R. F. Gun No. 1.

Burst gun.

Slice cut from tube, 11 ft. from muzzle.



## SLICE 11 FEET FROM MUZZLE.

Original diameter of rings in the slice.

| Rings. | Diameters. | | |
|---|---|---|---|
| | A. | B. | Mean. |
| | *Inches.* | *Inches.* | *Inches.* |
| 1 | 5.2252 | 5.2308 | 5.22775 |
| 2 | 5.7852 | 5.7808 | 5.7830 |
| 3 | 6.3330 | 6.3318 | 6.3324 |
| 4 | 9.4330 | 9.4396 | 9.4363 |
| RINGS ALL DETACHED. | | | |
| 1 detached | 5.2292 | 5.2261 | 5.22765 |
| 2 detached | 5.7856 | 5.7813 | 5.78345 |
| 3 detached | 6.3328 | 6.3320 | 6.3324 |
| 4 detached | 9.4339 | 9.4396 | 9.43685 |

## SLICE 11 FEET FROM MUZZLE.

SLICE INTACT.

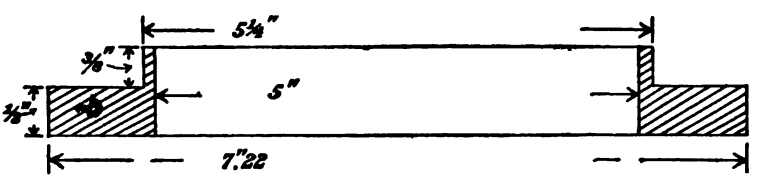
State of internal strains and stresses.

| Rings. | Present mean diameters. | Strains. | | Stresses per square inch. | |
|---|---|---|---|---|---|
| | | Tension. | Compression. | Tension. | Compression. |
| | *Inches.* | *Inch.* | *Inch.* | *Pounds.* | *Pounds.* |
| 1 | 5.22775 | .0001 | ..... | 600 | ..... |
| 2 | 5.7830 | ..... | .00045 | ..... | 2,300 |
| 3 | 6.3324 | 0. | 0. | 0 | 0 |
| 4 | 9.4363 | ..... | .00055 | ..... | 1,700 |

Ring 1 cut apart radially, whereupon the ends closed in a distance of about ".23 circumferentially.

The lands of the ring showed very generally, on their top surfaces, short circumferential cracks.

Slice taken 4" from muzzle end of tube.




In cutting off the ½" slice from the tube, when the metal below the cutting off tool was about 5¼" diameter the tool was changed and a narrower one employed to detach the slice, leaving the slice with a thin ring of metal attached at one end, as shown in the above sketch.

The slice was then faced off on each end, and the outside of the ring of attached metal turned down to 5".227 diameter.

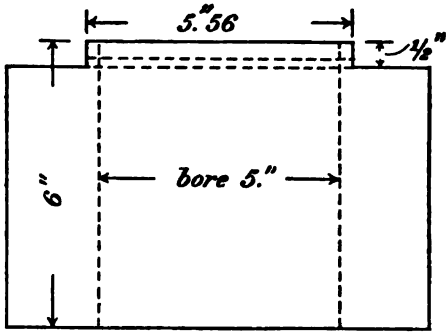
Measurements of the bore at the outer end of the attached ring were then begun, and continued as the metal in the attached ring was turned down to smaller diameters.

| Exterior diameter of ring. | Micrometer reading | Thickness of metal in ring over lands. | Strains released. | |
|---|---|---|---|---|
| | | | Total contraction. | Successive contraction. |
| *Inches.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 5.227 | .1922 | .1135 | 0. | 0. |
| 5.187 | .1917 | .0935 | .0005 | .0005 |
| 5.147 | .1912 | .0735 | .0010 | .0005 |
| 5.107 | .1904 | .0535 | .0018 | .0008 |

The tensile stress corresponding to the total strain, ".0018 released, is (.0018 × 30,000,000) ÷ 5.00 = 10,800 pounds per square inch.

The thin ring was now detached and cut apart radially, whereupon the ends sprung together, overlapping each other 1".30, thus releasing residual strains, and indicating the prior existence of internal strains of rapidly varying intensity in the walls of the thin ring.

Section 6" long taken from the tube, 5 feet from the muzzle.




At one end of the 6" section the metal was turned down, a length of ½", until the exterior diameter was reduced to 5."56. At this state two diameters were established at the bore ".10 from the outside end of the ring which had been thus formed by the turning down of the metal.

On these two diameters, taken at right angles to each other, measurements were taken as the ring was successively reduced in thickness, with the following results:

| Exterior diameter of ring. | Thickness of metal in ring. | Micrometer readings on diameters. | | Successive change in diameters. | |
|---|---|---|---|---|---|
| | | A. | B. | A. | B. |
| *Inches.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 5.56 | .25 | .1999 | .2005 | 0. | 0. |
| 5.46 | .20 | .1997 | .2008 | —.0002 | —.0002 |
| 5.86 | .15 | .1991 | .1997 | —.0006 | —.0006 |
| 5.26 | .10 | .1982 | .1988 | —.0009 | —.0009 |
| Total contraction of ring at the bore..... | | | | .0017 | .0017 |

The ring, as above shown, had been contracting on the measured diameters as the outside metal was turned off, leaving its inner surface, the original surface of the bore, undisturbed.

The ring was now detached from the end of the piece, after which the micrometer readings were as follows:

| | A. | B. |
|---|---|---|
| | *Inch.* | *Inch.* |
| Diameters | .1914 | .2098 |
| Successive change | −.0068 | +.0110 |

The detached ring became elliptic.

The ring was cut apart radially, whereupon the ends sprung together a distance of ″.62½, measured on a chord of 1″.00

## Section 6 Inches Long cut from the Tube, 8 Feet from the Muzzle.

Section turned down in the same manner as the 6″ section taken 5 feet from muzzle.

When the ring on the end of piece was turned down to 5″.66 exterior diameter, measurements at the bore were begun, and continued as follows:

| Exterior diameter of ring. | Thickness of metal over grooves. | Micrometer readings on diameters. | | Successive change in diameters. | |
|---|---|---|---|---|---|
| | | A. | B. | A. | B. |
| *Inches.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 5.66 | .30 | .2038 | .2008 | | |
| 5.56 | .25 | .2034 | .2004 | −.0004 | −.0004 |
| 5.46 | .20 | .2027 | .1999 | −.0007 | −.0005 |
| 5.36 | .15 | .2023 | .1993 | −.0004 | −.0006 |
| 5.26 | .10 | .2012 | .1979 | −.0011 | −.0014 |
| Total contraction of ring at the bore ..... | | | | .0026 | .0029 |

The ring was now cut off the end of the piece, after which the diameters measured as follows: A, ″.2032; B, ″.2012, thus showing an expansion of ″.0020 and .0033. The ring was cut apart radially, whereupon the ends sprung together a distance of ″.55, measured on a chord of 1″.00.

## SECTION 6 INCHES LONG TAKEN FROM THE TUBE 11 FEET FROM THE MUZZLE END.

Section turned down at one end in the same manner as the section 5 feet from muzzle.

When the ring on the end of the piece was turned down to 6″.14 diameter, measurements at the bore began and were continued as follows:

| Exterior diameter of ring. | Thickness of metal over grooves. | Micrometer readings on diameters. | | Successive change in diameters. | |
|---|---|---|---|---|---|
| | | A. | B. | A. | B. |
| *Inches.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 6.14 | .54 | .1989 | .2006 | 0. | 0. |
| 6.06 | .50 | .1988 | .2004 | .0001 | .0002 |
| 5.96 | .45 | .1988 | .2004 | 0. | 0. |
| 5.86 | .40 | .1987 | .2002 | .0001 | .0002 |
| 5.76 | .35 | .1987 | .2002 | 0. | 0. |
| 5.66 | .30 | .1985 | .2001 | .0002 | .0001 |
| 5.56 | .25 | .1981 | .1997 | .0004 | .0004 |
| 5.46 | .20 | .1978 | .1993 | .0008 | .0004 |
| 5.36 | .15 | .1968 | .1992 | .0005 | .0001 |
| 5 26 | .10 | .1963 | .1987 | .0005 | .0005 |
| Total contraction of ring at the bore..... | | | | .0028 | .0019 |

The ring was now cut off the end of the piece, after which the diameters measured as follows: A, ″.2072; B, ″.1925; thus showing an expansion on diameter A of ″.0109, and a contraction on diameter B of ″.0062.

The ring was cut apart radially, whereupon the ends sprung together a distance of ″.36 measured on a chord of 1″.00.

A ring 4″ from the muzzle end, ½″ long, and ″.10 thick over the grooves was cut off and then cut apart radially, whereupon the ends sprung together a distance of ″.22, measured on a chord of 1″.00.

# 5-INCH R. F. GUN TUBES.

## TENSION SPECIMENS FROM INITIAL TENSION SLICES.

## TANGENTIAL SPECIMENS FROM 5-INCH TUBE 11272 $B_2$.

### BREECH SLICE.

### No. 6458.

Diameter, ".480.
Sectional area, .181 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 181 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 905 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1 810 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,620 | 20,000 | .000633 | .000333 | ..... | ..... | |
| 5,430 | 30,000 | .001000 | .000367 | ..... | ..... | |
| 6,335 | 35,000 | .001167 | .000167 | ..... | ..... | |
| 7.240 | 40,000 | .001333 | .000166 | 0. | ..... | |
| 8,145 | 45,000 | .001533 | .000200 | ..... | ..... | |
| 8,688 | 48,000 | .001667 | .000134 | ..... | ..... | |
| 8,869 | 49,000 | .001700 | .000033 | ..... | ..... | Elastic limit. |
| 9,050 | 50,000 | .003367 | .001667 | ..... | ..... | |
| 9,231 | 51,000 | .005400 | .002033 | ..... | ..... | |
| 9,412 | 52,000 | .007367 | .001967 | ..... | ..... | |
| 9,593 | 53,000 | .008300 | .000933 | ..... | ..... | |
| 9,774 | 54,000 | .009167 | .000867 | ..... | ..... | |
| 10,136 | 56,000 | .011000 | .001833 | ..... | ..... | |
| 10,498 | 58,000 | .013233 | .002233 | ..... | ..... | |
| 10,860 | 60,000 | .014900 | .001667 | ..... | ..... | |
| 11,222 | 62,000 | .017000 | .002100 | ..... | ..... | |
| 11,584 | 64,000 | .019700 | .002700 | ..... | ..... | |
| 11,946 | 66,000 | .021667 | .001967 | ..... | ..... | |
| 12,308 | 68,000 | .024867 | .003200 | ..... | ..... | |
| 12,670 | 70,000 | .027167 | .002300 | ..... | ..... | |
| 13,032 | 72,000 | .030233 | .003066 | ..... | ..... | |
| 13,394 | 74,000 | .034033 | .003800 | ..... | ..... | |
| 13,756 | 76,000 | .038000 | .003967 | ..... | ..... | |
| 14,118 | 78,000 | .042367 | .004367 | ..... | ..... | |
| 14,480 | 80,000 | .048000 | .005633 | ..... | ..... | |
| 14,842 | 82,000 | .054833 | .006833 | ..... | ..... | |
| 16,220 | 89,610 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,610 |
| Elastic limit per square inch of original section | do... | 49,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .120 |
| Reduction in area after rupture, per cent of original section | | 46.8 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".34", ".19, ".19 |

## DUPLICATE OF No. 6458.

## No. 6459.

Diameter, ".480.
Sectional area, .181 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 181 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 905 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,810 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,620 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 5,430 | 30,000 | .000967 | .000834 | ..... | ..... | |
| 6,335 | 35,000 | .001133 | .000166 | ..... | ..... | |
| 7,240 | 40,000 | .001300 | .000167 | ..... | ..... | |
| 8,145 | 45.000 | .001500 | .000200 | ..... | ..... | |
| 9,050 | 50,000 | .001700 | .000200 | ..... | ..... | Elastic limit. |
| 9,231 | 51,000 | .003000 | .001300 | ..... | ..... | |
| 9,412 | 52,000 | .004333 | .001333 | ..... | ..... | |
| 9,593 | 53,000 | .006667 | .002334 | ..... | ..... | |
| 9,774 | 54,000 | .007400 | .000733 | ..... | ..... | |
| 10,136 | 56,000 | .009633 | .002233 | ..... | ..... | |
| 10,498 | 58,000 | .010900 | .001267 | ..... | ..... | |
| 10,860 | 60,000 | .012833 | .001933 | ..... | ..... | |
| 11,222 | 62,000 | .014633 | .001800 | ..... | ..... | |
| 11,584 | 64,000 | .017000 | .002367 | ..... | ..... | |
| 11,946 | 66,000 | .019333 | .002333 | ..... | ..... | |
| 12,308 | 68,000 | .021000 | .001667 | ..... | ..... | |
| 12,670 | 70,000 | .024000 | .003000 | ..... | ..... | |
| 13,032 | 72,000 | .026000 | .002000 | ..... | ..... | |
| 13,394 | 74,000 | .029667 | .003667 | ..... | ..... | |
| 13,756 | 76,000 | .031667 | .002000 | ..... | ..... | |
| 14,118 | 78,000 | .036333 | .004666 | ..... | ..... | |
| 14,480 | 80,000 | .040333 | .004000 | ..... | ..... | |
| 14,842 | 82,000 | .045000 | .004667 | ..... | ..... | |
| 15,204 | 84,000 | .051000 | .006000 | ..... | ..... | |
| 16,640 | 91,930 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,930 |
| Elastic limit per square inch of original section | do... | 50,000 |
| Elongation per inch after rupture | inch.. | .2033 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .120 |
| Reduction in area after rupture, per cent of original section | | 43.8 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | silky, oblique, trace of granulation |
| Elongation of inch sections | | " 84th " 15, ".12 |

## TANGENTIAL SPECIMENS FROM ANNEALED 5-INCH TUBE, 11272 $B_3$.

### BREECH SLICE.

### No. 6460.

Diameter, ".480.
Sectional area, .181 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 181 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 905 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,810 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,620 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 5,430 | 30,000 | .000967 | .000834 | ..... | ..... | |
| 6,335 | 35,000 | .001133 | .000166 | ..... | ..... | |
| 7,240 | 40,000 | .001300 | .000167 | 0. | ..... | |
| 8,145 | 45,000 | .001500 | .000200 | ..... | ..... | |
| 8,688 | 48,000 | .001667 | .000167 | ..... | ..... | Elastic limit. |
| 8,869 | 49,000 | .001733 | .000066 | ..... | ..... | |
| | | .002333 | .000600 | ..... | ..... | |
| 9,050 | 50,000 | .005000 | .002667 | ..... | ..... | |
| 9,231 | 51,000 | .005667 | .000667 | ..... | ..... | |
| 9,412 | 52,000 | .006333 | .000666 | ..... | ..... | |
| 9,593 | 53,000 | .007700 | .001367 | ..... | ..... | |
| 9,774 | 54,000 | .008333 | .000633 | ..... | ..... | |
| 9,955 | 55,000 | .009667 | .001334 | ..... | ..... | |
| 10,136 | 56,000 | .010033 | .000366 | ..... | ..... | |
| 10,317 | 57,000 | .011000 | .000967 | ..... | ..... | |
| 10,498 | 58,000 | .011833 | .000833 | ..... | ..... | |
| 10,679 | 59,000 | .013333 | .001500 | ..... | ..... | |
| 10,860 | 60,000 | .013733 | .000400 | ..... | ..... | |
| 11,222 | 62,000 | .015700 | .001967 | ..... | ..... | |
| 11,584 | 64,000 | .017400 | .001700 | ..... | ..... | |
| 11,946 | 66,000 | .019700 | .002300 | ..... | ..... | |
| 12,308 | 68,000 | .022500 | .002800 | ..... | ..... | |
| 12,670 | 70,000 | .024267 | .001767 | ..... | ..... | |
| 13,032 | 72,000 | .027500 | .003233 | ..... | ..... | |
| 13,394 | 74,000 | .030000 | .002500 | ..... | ..... | |
| 13,756 | 76,000 | .033000 | .003000 | ..... | ..... | |
| 14,118 | 78,000 | .037333 | .004333 | ..... | ..... | |
| 14,480 | 80,000 | .042500 | .005167 | ..... | ..... | |
| 14,842 | 82,000 | .046167 | .003667 | ..... | ..... | |
| 15,204 | 84,000 | .053333 | .007166 | ..... | ..... | |
| 16,690 | 92,210 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,210 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001667 |
| Reduction in diameter at point of rupture | do... | .110 |
| Reduction in area after rupture, per cent of original section | | 40.6 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | silky 60 per cent, fine granular 40 per cent |
| Elongation of inch sections | | ".13, ".14, ".33" |

## DUPLICATE OF No. 6460.

## No. 6461.

Diameter, ".480.
Sectional area, .181 square inch.
Gauged length, 3".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 181 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 905 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,810 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,620 | 20,000 | .000633 | .000833 | ..... | ..... | |
| 5,430 | 30,000 | .000967 | .000834 | ..... | ..... | |
| 6,335 | 35,000 | .001133 | .000166 | ..... | ..... | |
| 7,240 | 40,000 | .001300 | .000167 | 0. | ..... | |
| 8,145 | 45,000 | .001467 | .000167 | ..... | ..... | |
| 8,326 | 46,000 | .001500 | .000033 | ..... | ..... | |
| 8,507 | 47,000 | .001567 | .000067 | ..... | ..... | Elastic limit. |
| 8,688 | 48,000 | .005400 | .003833 | ..... | ..... | |
| 8,869 | 49,000 | .006333 | .000933 | ..... | ..... | |
| 9,050 | 50,000 | .006667 | .000334 | ..... | ..... | |
| 9,231 | 51,000 | .007667 | .001000 | ..... | ..... | |
| 9,412 | 52,000 | .008633 | .000966 | ..... | ..... | |
| 9,593 | 53,000 | .009567 | .000934 | ..... | ..... | |
| 9,774 | 54,000 | .010600 | .001033 | ..... | ..... | |
| 10,136 | 56,000 | .012100 | .001500 | ..... | ..... | |
| 10,498 | 58,000 | .014600 | .002500 | ..... | ..... | |
| 10,860 | 60,000 | .015967 | .001367 | ..... | ..... | |
| 11,222 | 62,000 | .018633 | .002666 | ..... | ..... | |
| 11,584 | 64,000 | .020833 | .002200 | ..... | ..... | |
| 11,946 | 66,000 | .022833 | .002000 | ..... | ..... | |
| 12,308 | 68,000 | .026333 | .003500 | ..... | ..... | |
| 12,670 | 70,000 | .029167 | .002834 | ..... | ..... | |
| 13,032 | 72,000 | .031667 | .002500 | ..... | ..... | |
| 13,394 | 74,000 | .036000 | .004333 | ..... | ..... | |
| 13,756 | 76,000 | .039933 | .003933 | ..... | ..... | |
| 14,118 | 78,000 | .044500 | .004567 | ..... | ..... | |
| 14,480 | 80,000 | .051167 | .006667 | ..... | ..... | |
| 16,190 | 89,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,450 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2167 |
| Elongation per inch under strain at elastic limit | do... | .001567 |
| Reduction in diameter at point of rupture | do... | .120 |
| Reduction in area after rupture, per cent of original section | | 43.8 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | silky, in part interspersed with fine granulation |
| Elongation of inch sections | | ".349, ".17, ".14 |

# SOFT STEEL CAPS FOR 5-INCH A. P. SHELL.

## No. 6226.

Marks, $\frac{5\,A\,P}{C\,1}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000300 | ..... | ..... | |
| 5,000 | 25,000 | .000750 | .000200 | ..... | ..... | |
| 5,200 | 26,000 | .000800 | .000050 | ..... | ..... | Elastic limit. |
| 5,400 | 27,000 | .009600 | .008800 | ..... | ..... | |
| 5,600 | 28,000 | .011000 | .001400 | ..... | ..... | |
| 5,800 | 29,000 | .012400 | .001400 | ..... | ..... | |
| 6,000 | 30,000 | .014000 | .001600 | ..... | ..... | |
| 11,090 | 55,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 55,450 |
| Elastic limit per square inch of original section | do... | 26,000 |
| Elongation per inch after rupture | inch.. | .3250 |
| Elongation per inch under strain at elastic limit | do... | .000800 |
| Reduction in diameter at point of rupture | do... | .165 |
| Reduction in area after rupture, per cent of original section | | 54.6 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".23, ".42* |

## No. 6227.

Marks, $\frac{5\,A\,P}{C\,2}$
Diameter, ".500.
Sectional area, .196 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 196 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 980 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 1,960 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 3,920 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 4,900 | 25,000 | .000850 | .000250 | ..... | ..... | |
| 5,096 | 26,000 | .000950 | .000100 | ..... | ..... | Elastic limit. |
| 5,292 | 27,000 | .001500 | .000550 | ..... | ..... | |
| 5,488 | 28,000 | .010250 | .008750 | ..... | ..... | |
| 5,684 | 29,000 | .012000 | .001750 | ..... | ..... | |
| 5,880 | 30,000 | .013500 | .001500 | ..... | ..... | |
| 6,076 | 31,000 | .015500 | .002000 | ..... | ..... | |
| 11,170 | 56,990 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,990 |
| Elastic limit per square inch of original section | do... | 26,000 |
| Elongation per inch after rupture | inch.. | .3600 |
| Elongation per inch under strain at elastic limit | do... | .000950 |
| Reduction in diameter at point of rupture | do... | .155 |
| Reduction in area after rupture, per cent of original section | | 51.9 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | fine, silky |

## No. 6228.

Marks, $\frac{5\ A\ P}{C\ 3}$
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 5,000 | 25,000 | .000950 | .000300 | ..... | ..... | |
| 5,200 | 26,000 | .001000 | .000050 | ..... | ..... | |
| 5,400 | 27,000 | .001050 | .000050 | ..... | ..... | Elastic limit. |
| 5,600 | 28,000 | .012000 | .010950 | ..... | ..... | |
| 5,800 | 29,000 | .013100 | .001100 | ..... | ..... | |
| 6,000 | 30,000 | .014900 | .001800 | ..... | ..... | |
| 6,200 | 31,000 | .016550 | .001650 | ..... | ..... | |
| 6,400 | 32,000 | .018600 | .002050 | ..... | ..... | |
| 11,240 | 56,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 56,200 |
| Elastic limit per square inch of original section | do... | 27,000 |
| Elongation per inch after rupture | inch.. | .3900 |
| Elongation per inch under strain at elastic limit | do... | .001050 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | | 59.8 |
| Position of rupture | | 1".7 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".44", ".34 |

# CAST-STEEL SHELL BODIES.

SPECIMENS FROM 800-POUND AND 1,000-POUND B. L. MORTAR SHELLS.

505

## 800-Pound Shells.

### No. 6035.

Marks, 5153.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,600 | 38,000 | .001450 | .000450 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001850 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .004500 | .002650 | ..... | ..... | |
| 8,200 | 41,000 | .007000 | .002500 | ..... | ..... | |
| 8,400 | 42,000 | .007950 | .000950 | ..... | ..... | |
| 8,800 | 44,000 | .009900 | .001950 | ..... | ..... | |
| 9,200 | 46,000 | .012500 | .002600 | ..... | ..... | |
| 9,600 | 48,000 | .015000 | .002500 | ..... | ..... | |
| 10,000 | 50,000 | .016500 | .001500 | ..... | ..... | |
| 10,400 | 52,000 | .018550 | .002050 | ..... | ..... | |
| 10,800 | 54,000 | .021000 | .002450 | ..... | ..... | |
| 11,200 | 56,000 | .024000 | .003000 | ..... | ..... | |
| 11,600 | 58,000 | .027000 | .003000 | ..... | ..... | |
| 12,000 | 60,000 | .030000 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0100 | ..... | ..... | |
| 13,600 | 68,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 68,000 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .0600 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ".1 from neck |
| Character of broken surface | | granular 40 per cent, dull silky 60 per cent |
| Elongation of inch sections | | ".05, ".07 |

## No. 6036.

Marks, 5161.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,800 | 39,000 | .001550 | .000550 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001750 | .000200 | ..... | ..... | |
| 8,200 | 41,000 | .004750 | .003000 | ..... | ..... | |
| 8,400 | 42,000 | .007500 | .002750 | ..... | ..... | |
| 8,600 | 43,000 | .008900 | .001400 | ..... | ..... | |
| 8,800 | 44,000 | .009900 | .001000 | ..... | ..... | |
| 9,200 | 46,000 | .012000 | .002100 | ..... | ..... | |
| 9,600 | 48,000 | .014250 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .015900 | .001650 | ..... | ..... | |
| 10,400 | 52,000 | .018500 | .002600 | ..... | ..... | |
| 10,800 | 54,000 | .020100 | .001600 | ..... | ..... | |
| 11,200 | 56,000 | .022500 | .002400 | ..... | ..... | |
| 11,600 | 58,000 | .025500 | .003000 | ..... | ..... | |
| 12,000 | 60,000 | .028900 | .003400 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0061 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0700 | .0150 | ..... | ..... | |
| 15,720 | 78,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,600 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .0060 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granular 85 per cent, dull silky 15 per cent |
| Elongation of inch sections | | ".11*, ".08 |

## No. 6037.

Marks, 5167.
Diameter, .505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,600 | 38,000 | .001650 | .000650 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001900 | .000250 | ..... | ..... | |
| 8,000 | 40,000 | .006750 | .004850 | ..... | ..... | |
| 8,200 | 41,000 | .008000 | .001250 | ..... | ..... | |
| 8,400 | 42,000 | .009400 | .001400 | ..... | ..... | |
| 8,800 | 44,000 | .011350 | .001950 | ..... | ..... | |
| 9,200 | 46,000 | .013300 | .001950 | ..... | ..... | |
| 9,600 | 48,000 | .015500 | .002200 | ..... | ..... | |
| 10,000 | 50,000 | .017650 | .002150 | ..... | ..... | |
| 10,400 | 52,000 | .020000 | .002350 | ..... | ..... | |
| 10,800 | 54,000 | .022750 | .002750 | ..... | ..... | |
| 11,200 | 56,000 | .025500 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .028500 | .003000 | ..... | ..... | |
| 12,000 | 60,000 | .031750 | .003250 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .008250 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0650 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0900 | .0250 | ..... | ..... | |
| 15,610 | 78,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,050 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .1250 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.35 from neck |
| Character of broken surface | | dull silky |
| Elongation of inch sections | | ″.11, ″.14* |

## No. 6038.

Marks, 5173.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,200 | 36,000 | .001450 | .000450 | ..... | ..... | |
| 7,400 | 37,000 | .001550 | .000100 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .004500 | .002950 | ..... | ..... | |
| 7,800 | 39,000 | .005400 | .000900 | ..... | ..... | |
| 8,000 | 40,000 | .006650 | .001250 | ..... | ..... | |
| 8,200 | 41,000 | .007500 | .000850 | ..... | ..... | |
| 8,400 | 42,000 | .008750 | .001250 | ..... | ..... | |
| 8,800 | 44,000 | .010750 | .002000 | ..... | ..... | |
| 9,200 | 46,000 | .012500 | .001750 | ..... | ..... | |
| 9,600 | 48,000 | .015000 | .002500 | ..... | ..... | |
| 10,000 | 50,000 | .017100 | .002100 | ..... | ..... | |
| 10,400 | 52,000 | .019500 | .002400 | ..... | ..... | |
| 10,800 | 54,000 | .021750 | .002250 | ..... | ..... | |
| 11,200 | 56,000 | .025250 | .003500 | ..... | ..... | |
| 11,600 | 58,000 | .027500 | .002250 | ..... | ..... | |
| 12,000 | 60,000 | .031000 | .003500 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0090 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0800 | .0200 | ..... | ..... | |
| 15,730 | 78,650 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,650 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .1150 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".4 from neck |
| Character of broken surface | | granular 85 per cent, dull silky, 15 per cent |
| Elongation of inch sections | | ".10, ".13 |

## No. 6039.

Marks, 5181.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000850 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | 0. | ..... | |
| 7,800 | 39,000 | .001500 | .000450 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001750 | .000250 | ..... | ..... | |
| 8,200 | 41,000 | .004500 | .002750 | ..... | ..... | |
| 8,400 | 42,000 | .009000 | .004500 | ..... | ..... | |
| 8,600 | 43,000 | .010000 | .001000 | ..... | ..... | |
| 8,800 | 44,000 | .011650 | .001650 | ..... | ..... | |
| 9,200 | 46,000 | .014000 | .002350 | ..... | ..... | |
| 9,600 | 48,000 | .016000 | .002000 | ..... | ..... | |
| 10,000 | 50,000 | .018250 | .002250 | ..... | ..... | |
| 10,400 | 52,000 | .020500 | .002250 | ..... | ..... | |
| 10,800 | 54,000 | .023500 | .003000 | ..... | ..... | |
| 11,200 | 56,000 | .026400 | .002900 | ..... | ..... | |
| 11,600 | 58,000 | .029450 | .003050 | ..... | ..... | |
| 12,000 | 60,000 | .033000 | .003550 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0070 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0650 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0950 | .0300 | ..... | ..... | |
| 15,540 | 77,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pound... | 77,700 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch. | .1300 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".55 from neck |
| Character of broken surface | | granular 80 per cent, dull silky 20 per cent |
| Elongation of inch sections | | ".11, ".15 |

## No. 6040.

Marks, 5188.
Diameter, ".505.
Sectional area, .20 square inch
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 7,600 | 38,000 | .001550 | .000550 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001750 | .000200 | ..... | ..... | |
| 8,000 | 40,000 | .008500 | .006750 | ..... | ..... | |
| 8,200 | 41,000 | .009450 | .000950 | ..... | ..... | |
| 8,400 | 42,000 | .010500 | .001050 | ..... | ..... | |
| 8,800 | 44,000 | .012500 | .002000 | ..... | ..... | |
| 9,200 | 46,000 | .014750 | .002250 | ..... | ..... | |
| 9,600 | 48,000 | .017000 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .019500 | .002500 | ..... | ..... | |
| 10,400 | 52,000 | .021650 | .002150 | ..... | ..... | |
| 10,800 | 54,000 | .024750 | .003100 | ..... | ..... | |
| 11,200 | 56,000 | .027500 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .031600 | .004100 | ..... | ..... | |
| 12,000 | 60,000 | .034250 | .002650 | ..... | ..... | |
| 12,800 | 64,000 | .0450 | .010750 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0700 | .0200 | ..... | ..... | |
| 15,200 | 76,000 | .1000 | .0300 | ..... | ..... | |
| 15,630 | 78,150 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,150 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".25 from neck |
| Character of broken surface | | granular 40 per cent, dull silky 60 per cent |
| Elongation of inch sections | | ".14, ".16 |

## No. 6041.

Marks, 5195.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | 0. | ..... | |
| 7,800 | 39,000 | .001500 | .000450 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001800 | .000800 | ..... | ..... | |
| 8,200 | 41,000 | .005000 | .003200 | ..... | ..... | |
| 8,400 | 42,000 | .007750 | .002750 | ..... | ..... | |
| 8,600 | 43,000 | .009000 | .001250 | ..... | ..... | |
| 8,800 | 44,000 | .009500 | .000500 | ..... | ..... | |
| 9,200 | 46,000 | .011650 | .002150 | ..... | ..... | |
| 9,600 | 48,000 | .013900 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .016000 | .002100 | ..... | ..... | |
| 10,400 | 52,000 | .017900 | .001900 | ..... | ..... | |
| 10,850 | 54,000 | .020150 | .002250 | ..... | ..... | |
| 11,200 | 56,000 | .022650 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .025550 | .002900 | ..... | ..... | |
| 12,000 | 60,000 | .028600 | .003050 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0064 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0150 | ..... | ..... | |
| 15 200 | 76,000 | .0700 | .0150 | ..... | ..... | |
| 15,860 | 79,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 79,300 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".12*, ".12* |

## No. 6042.

Marks, 5202.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | 0. | ..... | |
| 6,800 | 34,000 | .001450 | .000400 | ..... | ..... | Elastic limit. |
| 7,000 | 35,000 | .001650 | .000200 | ..... | ..... | |
| 7,200 | 36,000 | .002450 | .000800 | ..... | ..... | |
| 7,400 | 37,000 | .008150 | .000700 | ..... | ..... | |
| 7,600 | 38,000 | .004500 | .001350 | ..... | ..... | |
| 7,800 | 39,000 | .005750 | .001250 | ..... | ..... | |
| 8,000 | 40,000 | .006600 | .000850 | ..... | ..... | |
| 8,400 | 42,000 | .008500 | .001900 | ..... | ..... | |
| 8,800 | 44,000 | .010250 | .001750 | ..... | ..... | |
| 9,200 | 46,000 | .012000 | .001750 | ..... | ..... | |
| 9,600 | 48,000 | .013750 | .001750 | ..... | ..... | |
| 10,000 | 50,000 | .016500 | .002750 | ..... | ..... | |
| 10,400 | 52,000 | .018500 | .002000 | ..... | ..... | |
| 10,800 | 54,000 | .020550 | .002050 | ..... | ..... | |
| 11,200 | 56,000 | .023000 | .002450 | ..... | ..... | |
| 11,600 | 58,000 | .025750 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .029000 | .003250 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0060 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0750 | .0200 | ..... | ..... | |
| 16,000 | 80,000 | .1200 | .0450 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,000 |
| Elastic limit per square inch of original section | do... | 34,000 |
| Elongation per inch after rupture | inch.. | .1250 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".45 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ".14", ".11 |

## No. 6043.

Marks, 5210.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,800 | 39,000 | .001500 | .000500 | ..... | ..... | |
| 8,000 | 40,000 | .001600 | .000100 | ..... | ..... | Elastic limit. |
| 8,200 | 41,000 | .005000 | .003400 | ..... | ..... | |
| 8,400 | 42,000 | .008500 | .003500 | ..... | ..... | |
| 8,600 | 43,000 | .009500 | .001000 | ..... | ..... | |
| 8,800 | 44,000 | .010500 | .001000 | ..... | ..... | |
| 9,200 | 46,000 | .012900 | .002400 | ..... | ..... | |
| 9,600 | 48,000 | .014900 | .002000 | ..... | ..... | |
| 10,000 | 50,000 | .017100 | .002200 | ..... | ..... | |
| 10,400 | 52,000 | .019250 | .002150 | ..... | ..... | |
| 10,800 | 54,000 | .021600 | .002350 | ..... | ..... | |
| 11,200 | 56,000 | .024750 | .003150 | ..... | ..... | |
| 11,600 | 58,000 | .027700 | .002950 | ..... | ..... | |
| 12,000 | 60,000 | .031050 | .003350 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .008950 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0850 | .0250 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of orginal section | pounds.. | 76,000 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".09*, ".08 |

## No. 6044.

Marks, 5217.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000500 | ..... | ..... | |
| 8,000 | 41,000 | .001450 | 0. | ..... | ..... | |
| 8,400 | 42,000 | .001500 | .000050 | ..... | ..... | |
| 8,600 | 43,000 | .001600 | .000100 | ..... | ..... | Elastic limit. |
| 8,800 | 44,000 | .010500 | .008900 | ..... | ..... | |
| 9,000 | 45,000 | .011250 | .000750 | ..... | ..... | |
| 9,200 | 46,000 | .012100 | .000850 | ..... | ..... | |
| 9,600 | 48,000 | .012950 | .000850 | ..... | ..... | |
| 10,000 | 50,000 | .015500 | .002550 | ..... | ..... | |
| 10,400 | 52,000 | .017400 | .001900 | ..... | ..... | |
| 10,800 | 54,000 | .020000 | .002600 | ..... | ..... | |
| 11,200 | 56,000 | .022150 | .002150 | ..... | ..... | |
| 11,600 | 58,000 | .025250 | .003100 | ..... | ..... | |
| 12,000 | 60,000 | .028250 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .001750 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,000 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .0800 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 2.5 |
| Position of rupture | | ".50 from neck |
| Character of broken surface | | granular 40 per cent, dull silky 60 per cent |
| Elongation of inch sections | | ".09", ".07 |

## No. 6045.

Marks, 5224.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | ..... | ..... | Elastic limit. |
| 8,200 | 41,000 | .007750 | .006400 | ..... | ..... | |
| 8,400 | 42,000 | .008750 | .001000 | ..... | ..... | |
| 8,600 | 43,000 | .009500 | .000750 | ..... | ..... | |
| 8,800 | 44,000 | .010500 | .001000 | ..... | ..... | |
| 9,200 | 46,000 | .012750 | .002250 | ..... | ..... | |
| 9,600 | 48,000 | .015000 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .017150 | .002150 | ..... | ..... | |
| 10,400 | 52,000 | .019750 | .002600 | ..... | ..... | |
| 10,800 | 54,000 | .022000 | .002250 | ..... | ..... | |
| 11,200 | 56,000 | .025500 | .003500 | ..... | ..... | |
| 11,600 | 58,000 | .028500 | .003000 | ..... | ..... | |
| 12,000 | 60,000 | .032000 | .003500 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0080 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0650 | .0150 | ..... | ..... | |
| 14,670 | 73,350 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 73,350 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .0800 |
| Elongation per inch under strain at elastic limit | do... | .001350 |
| Peduction in diameter at point of rupture | do... | .025 |
| Ceduction in area after rupture, per cent of original section | | 9.5 |
| Eosition of rupture | | ".85 from neck |
| Tharacter of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".07, ".09" |

## No. 6046.

Marks, 5233.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001500 | .000500 | ..... | ..... | |
| 8,200 | 41,000 | .001600 | .000100 | ..... | ..... | |
| 8,400 | 42,000 | .001700 | .000100 | ..... | ..... | Elastic limit. |
| 8,600 | 43,000 | .009250 | .007550 | ..... | ..... | |
| 8,800 | 44,000 | .010350 | .001100 | ..... | ..... | |
| 9,200 | 46,000 | .012000 | .001650 | ..... | ..... | |
| 9,600 | 48,000 | .014250 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .016500 | .002250 | ..... | ..... | |
| 10,400 | 52,000 | .019050 | .002550 | ..... | ..... | |
| 10,800 | 54,000 | .021500 | .002450 | ..... | ..... | |
| 11,200 | 56,000 | .024250 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .027000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .030900 | .003900 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0041 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0150 | ..... | ..... | |
| 14,420 | 72,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 72,100 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .0750 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | granular 40 per cent, dull silky 60 per cent | |
| Elongation of inch sections | | ".05, ".08 |

## No. 6047.

**Marks, 5238.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, "2.**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000450 | ..... | ..... | |
| 8,200 | 41,000 | .001500 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 8,600 | 43,000 | .001700 | .000150 | ..... | ..... | |
| 8,800 | 44,000 | .001950 | .000250 | ..... | ..... | |
| 9,000 | 45,000 | .008000 | .006050 | ..... | ..... | |
| 9,200 | 46,000 | .009000 | .001000 | ..... | ..... | |
| 9,600 | 48,000 | .010750 | .001750 | ..... | ..... | |
| 10,000 | 50,000 | .012500 | .001750 | ..... | ..... | |
| 10,400 | 52,000 | .014400 | .001900 | ..... | ..... | |
| 10,800 | 54,000 | .016250 | .001850 | ..... | ..... | |
| 11,200 | 56,000 | .018750 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .020500 | .001750 | ..... | ..... | |
| 12,000 | 60,000 | .023250 | .002750 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .006750 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0600 | .0100 | ..... | ..... | |
| 16,000 | 80,000 | .0750 | .0150 | ..... | ..... | |
| 16,410 | 82,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 82,050 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | granular 70 per cent, dull silky 30 per cent |
| Elongation of inch sections | | ".07, ".10* |

## No. 6048.

Marks, 5244.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 7,400 | 37,000 | .001350 | .000350 | ..... | ..... | |
| 7,600 | 38,000 | .001400 | .000050 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001650 | .000250 | ..... | ..... | |
| 8,000 | 40,000 | .007400 | .005750 | ..... | ..... | |
| 8,200 | 41,000 | .008350 | .000950 | ..... | ..... | |
| 8,400 | 42,000 | .009600 | .001250 | ..... | ..... | |
| 8,800 | 44,000 | .011500 | .001900 | ..... | ..... | |
| 9,200 | 46,000 | .014000 | .002500 | ..... | ..... | |
| 9,600 | 48,000 | .015600 | .001600 | ..... | ..... | |
| 10,000 | 50,000 | .018300 | .002700 | ..... | ..... | |
| 10,400 | 52,000 | .020950 | .002650 | ..... | ..... | |
| 10,800 | 54,000 | .023500 | .002550 | ..... | ..... | |
| 11,200 | 56,000 | .026250 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .030000 | .003750 | ..... | ..... | |
| 12,000 | 60,000 | .033750 | .003750 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .006250 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0650 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0950 | .0300 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,000 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .1050 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .1085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | granular 60 per cent dull silky 40 per cent |
| Elongation of inch sections | | ".11*, ".10 |

## No. 6050.

**Marks, 5044.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | ..... | ..... | |
| 2,000 | 10,000 | .000850 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000750 | .000400 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000250 | .000050 | .000050 | |
| 7,800 | 39,000 | .001550 | .000550 | ..... | ..... | Elastic limit |
| 8,000 | 40,000 | .001850 | .000300 | ..... | ..... | |
| 8,200 | 41,000 | .007500 | .005650 | ..... | ..... | |
| 8,400 | 42,000 | .008900 | .001400 | ..... | ..... | |
| 8,800 | 44,000 | .010400 | .001500 | ..... | ..... | |
| 9,200 | 46,000 | .012650 | .002250 | ..... | ..... | |
| 9,600 | 48,000 | .014900 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .016750 | .001850 | ..... | ..... | |
| 10,400 | 52,000 | .019000 | .002250 | ..... | ..... | |
| 10,800 | 54,000 | .021500 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .024400 | .002900 | ..... | ..... | |
| 11,600 | 58,000 | .027000 | .002600 | ..... | ..... | |
| 12,000 | 60,000 | .030000 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0050 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0700 | .0150 | ..... | ..... | |
| 15,410 | 77,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| **Tensile strength per square inch of original section** | pounds.. | 77,050 |
| **Elastic limit per square inch of original section** | do... | 39,000 |
| **Elongation per inch after rupture** | inch.. | .0850 |
| **Elongation per inch under strain at elastic limit** | do... | .001550 |
| **Reduction in diameter at point of rupture** | do... | .015 |
| **Reduction in area after rupture, per cent of original section** | | 5.7 |
| **Position of rupture** | | ".6 from neck |
| **Character of broken surface** | | granular, dull spot at circumference |
| **Elongation of inch sections** | | ".09*, ".08 |

## No. 6051.

Marks, 5254,
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | 0. | ..... | |
| 7,800 | 39,000 | .001600 | .000550 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001900 | .000300 | ..... | ..... | |
| 8,200 | 41,000 | .002400 | .000500 | ..... | ..... | |
| 8,400 | 42,000 | .008500 | .006100 | ..... | ..... | |
| 8,800 | 44,000 | .009500 | .001000 | ..... | ..... | |
| 9,200 | 46,000 | .011500 | .002000 | ..... | ..... | |
| 9,600 | 48,000 | .013750 | .002250 | ..... | ..... | |
| 10,000 | 50,000 | .015500 | .001750 | ..... | ..... | |
| 10,400 | 52,000 | .018500 | .003000 | ..... | ..... | |
| 10,800 | 54,000 | .020900 | .002400 | ..... | ..... | |
| 11,200 | 56,000 | .023250 | .002350 | ..... | ..... | |
| 11,600 | 58,000 | .026000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .028900 | .002900 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0061 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0150 | ..... | ..... | |
| 14,610 | 73,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 73,050 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .0700 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".2 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".08", ".06 |

## No. 6052.

**Marks, 5261.**
**Diameter, ″.505.**
**Sectional area, .20 square inch.**
**Gauged length, 2″.**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | .0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000800 | ..... | ..... | |
| 4,000 | 20,000 | .000750 | .000850 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000300 | 0. | ..... | |
| 7,400 | 37,000 | .001600 | .000550 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001750 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .002050 | .000300 | ..... | ..... | |
| 8,000 | 40,000 | .002500 | .000450 | ..... | ..... | |
| 8,200 | 41,000 | .004950 | .002450 | ..... | ..... | |
| 8,400 | 42,000 | .007250 | .002300 | ..... | ..... | |
| 8,800 | 44,000 | .009400 | .002150 | ..... | ..... | |
| 9,200 | 46,000 | .010750 | .001350 | ..... | ..... | |
| 9,600 | 48,000 | .013050 | .002300 | ..... | ..... | |
| 10,000 | 50,000 | .014750 | .001700 | ..... | ..... | |
| 10,400 | 52,000 | .017500 | .002750 | ..... | ..... | |
| 10,800 | 54,000 | .020900 | .003400 | ..... | ..... | |
| 11,200 | 56,000 | .022400 | .001500 | ..... | ..... | |
| 11,600 | 58,000 | .025000 | .002600 | ..... | ..... | |
| 12,000 | 60,000 | .027900 | .002900 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0021 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0700 | .0200 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,000 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .0800 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | 1″ from neck |
| Character of broken surface | | granular 80 per cent, dull silky 20 per cent |
| Elongation of inch sections | | ″.06, ″.10ª |

## No. 6053.

Marks, 5268.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000800 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,400 | 37,000 | .001600 | .000600 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001950 | .000350 | ..... | ..... | |
| 7,800 | 39,000 | .002450 | .000500 | ..... | ..... | |
| 8,000 | 40,000 | .008000 | .000550 | ..... | ..... | |
| 8,400 | 42,000 | .004150 | .001150 | ..... | ..... | |
| 8,800 | 44,000 | .006250 | .002100 | ..... | ..... | |
| 9,200 | 46,000 | .007650 | .001400 | ..... | ..... | |
| 9,600 | 48,000 | .009500 | .001850 | ..... | ..... | |
| 10,000 | 50,000 | .011650 | .002150 | ..... | ..... | |
| 10,400 | 52,000 | .013500 | .001850 | ..... | ..... | |
| 10,800 | 54,000 | .015500 | .002000 | ..... | ..... | |
| 11,200 | 56,000 | .017500 | .002000 | ..... | ..... | |
| 11,600 | 58,000 | .020000 | .002500 | ..... | ..... | |
| 12,000 | 60,000 | .022400 | .002400 | ..... | ..... | |
| 12,800 | 64,000 | .0250 | .0026 | ..... | ..... | |
| 13,600 | 68,000 | .0300 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0400 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0500 | .0100 | ..... | ..... | |
| 16,000 | 80,000 | .0700 | .0200 | ..... | ..... | |
| 16,200 | 81,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 81,000 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".3 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ".07, ".10 |

## No. 6054.

**Marks, 5273.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,400 | 37,000 | .001450 | .000450 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001700 | .000250 | ..... | ..... | |
| 7,800 | 39,000 | .002450 | .000750 | ..... | ..... | |
| 8,000 | 40,000 | .003950 | .001500 | ..... | ..... | |
| 8,200 | 41,000 | .004850 | .000900 | ..... | ..... | |
| 8,400 | 42,000 | .005950 | .001100 | ..... | ..... | |
| 8,600 | 44,000 | .008000 | .002050 | ..... | ..... | |
| 8,800 | 46,000 | .009900 | .001900 | ..... | ..... | |
| 9,600 | 48,000 | .011550 | .001650 | ..... | ..... | |
| 10,000 | 50,000 | .013750 | .002200 | ..... | ..... | |
| 10,400 | 52,000 | .015800 | .002050 | ..... | ..... | |
| 10,800 | 54,000 | .018100 | .002300 | ..... | ..... | |
| 11,200 | 56,000 | .020400 | .002300 | ..... | ..... | |
| 11,600 | 58,000 | .023000 | .002600 | ..... | ..... | |
| 12,000 | 60,000 | .026000 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0040 | ..... | ..... | |
| 13,600 | 68,000 | .0350 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0150 | ..... | ..... | |
| 14,600 | 73,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 73,000 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .0700 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | granular 70 per cent, dull silky 30 per cent |
| Elongation of inch sections | | ".07* ".07* |

## No. 6055.

Marks, 5280.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000450 | .000050 | .000050 | |
| 7,200 | 36,000 | .001650 | .000600 | ..... | ..... | Elastic limit. |
| 7,400 | 37,000 | .002350 | .000700 | ..... | ..... | |
| 7,600 | 38,000 | .003500 | .001150 | ..... | ..... | |
| 7,800 | 39,000 | .004500 | .001000 | ..... | ..... | |
| 8,000 | 40,000 | .005900 | .001400 | ..... | ..... | |
| 8,400 | 42,000 | .008050 | .002150 | ..... | ..... | |
| 8,800 | 44,000 | .009900 | .001850 | ..... | ..... | |
| 9,200 | 46,000 | .012000 | .002100 | ..... | ..... | |
| 9,600 | 48,000 | .013900 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .016000 | .002100 | ..... | ..... | |
| 10,400 | 52,000 | .018600 | .002600 | ..... | ..... | |
| 10,800 | 54,000 | .020750 | .002150 | ..... | ..... | |
| 11,200 | 56,000 | .024250 | .003500 | ..... | ..... | |
| 11,600 | 58,000 | .027100 | .002850 | ..... | ..... | |
| 12,000 | 60,000 | .031000 | .003900 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0040 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0150 | ..... | ..... | |
| 14,610 | 73,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 73,050 |
| Elastic limit per square inch of original section | do... | 36,000 |
| Elongation per inch after rupture | inch.. | .0600 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | ..... | 9.5 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".08", ".08 |

## No. 6056.

**Marks, 5288.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000750 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000300 | 0. | ..... | |
| 8,000 | 40,000 | .001600 | .000550 | ..... | ..... | |
| 8,200 | 41,000 | .001650 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001700 | .000050 | ..... | ..... | Elastic limit. |
| 8,600 | 43,000 | .001850 | .000150 | ..... | ..... | |
| 8,800 | 44,000 | .008750 | .006900 | ..... | ..... | |
| 9,000 | 45,000 | .009150 | .000400 | ..... | ..... | |
| 9,200 | 46,000 | .009750 | .000600 | ..... | ..... | |
| 9,600 | 48,000 | .011650 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .013950 | .002300 | ..... | ..... | |
| 10,400 | 52,000 | .015900 | .001950 | ..... | ..... | |
| 10,800 | 54,000 | .017650 | .001750 | ..... | ..... | |
| 11,200 | 56,000 | .019950 | .002300 | ..... | ..... | |
| 11,600 | 58,000 | .022500 | .002550 | ..... | ..... | |
| 12,000 | 60,000 | .024600 | .002100 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0054 | ..... | ..... | |
| 13,600 | 68,000 | .0350 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0450 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0550 | .0100 | ..... | ..... | |
| 16,000 | 80,000 | .0750 | .0200 | ..... | ..... | |
| 16,610 | 83,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 83,050 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".50 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".09, ".13* |

## No. 6057.

Marks, 5295.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000300 | 0. | ..... | |
| 7,800 | 39,000 | .001550 | .000550 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001850 | .000300 | ..... | ..... | |
| 8,200 | 41,000 | .007000 | .005150 | ..... | ..... | |
| 8,400 | 42,000 | .008000 | .001000 | ..... | ..... | |
| 8,800 | 44,000 | .010500 | .002500 | ..... | ..... | |
| 9,200 | 46,000 | .012400 | .001900 | ..... | ..... | |
| 9,600 | 48,000 | .014500 | .002100 | ..... | ..... | |
| 10,000 | 50,000 | .016600 | .002100 | ..... | ..... | |
| 10,400 | 52,000 | .018500 | .001900 | ..... | ..... | |
| 10,800 | 54,000 | .021000 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .023500 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .026500 | .003000 | ..... | ..... | |
| 12,000 | 60,000 | .029250 | .002750 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .005750 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0750 | .0200 | ..... | ..... | |
| 15,460 | 77,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,300 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1000 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".40 from neck |
| Character of broken surface | | granular 55 per cent, dull silky 45 per cent |
| Elongation of inch sections | | ".08, ".12" |

## No. 6058.

Marks, 5303.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 7,400 | 37,000 | .001500 | .000500 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001650 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .002400 | .000750 | ..... | ..... | |
| 8,000 | 40,000 | .004500 | .002100 | ..... | ..... | |
| 8,400 | 42,000 | .006600 | .002100 | ..... | ..... | |
| 8,800 | 44,000 | .008900 | .002300 | ..... | ..... | |
| 9,200 | 46,000 | .010950 | .002050 | ..... | ..... | |
| 9,600 | 48,000 | .012500 | .001550 | ..... | ..... | |
| 10,000 | 50,000 | .014650 | .002150 | ..... | ..... | |
| 10,400 | 52,000 | .016500 | .001850 | ..... | ..... | |
| 10,800 | 54,000 | .019000 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .021100 | .002100 | ..... | ..... | |
| 11,600 | 58,000 | .023250 | .002150 | ..... | ..... | |
| 12,000 | 60,000 | .026600 | .003350 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0034 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0650 | .0150 | ..... | ..... | |
| 16,000 | 80,000 | .1000 | .0350 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,000 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .1050 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 2.5 |
| Position of rupture | | ".5 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ".11*, ".10 |

## No. 6059.

Marks, 5311.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,400 | 37,000 | .001400 | .000400 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001550 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .001950 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .002300 | .000350 | ..... | ..... | |
| 8,200 | 41,000 | .002650 | .000350 | ..... | ..... | |
| 8,400 | 42,000 | .003450 | .000800 | ..... | ..... | |
| 8,800 | 44,000 | .004800 | .001350 | ..... | ..... | |
| 9,200 | 46,000 | .006500 | .001700 | ..... | ..... | |
| 9,600 | 48,000 | .008150 | .001650 | ..... | ..... | |
| 10,000 | 50,000 | .010100 | .001950 | ..... | ..... | |
| 10,400 | 52,000 | .012000 | .001900 | ..... | ..... | |
| 10,800 | 54,000 | .013800 | .001800 | ..... | ..... | |
| 11,200 | 56,000 | .016000 | .002200 | ..... | ..... | |
| 11,600 | 58,000 | .017950 | .001950 | ..... | ..... | |
| 12,000 | 60,000 | .020900 | .002950 | ..... | ..... | |
| 12,800 | 64,000 | .0250 | .0041 | ..... | ..... | |
| 13,600 | 68,000 | .0300 | .0050 | ..... | ..... | |
| 14,000 | 72,000 | .0400 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0500 | .0100 | ..... | ..... | |
| 15,790 | 78,950 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,950 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .0650 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ".4 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ".07", ".06 |

## No. 6060.

**Marks, 5318.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 6,800 | 34,000 | .001450 | .000450 | ..... | ..... | Elastic limit. |
| 7,000 | 35,000 | .001500 | .000050 | ..... | ..... | |
| 7,200 | 36,000 | .001650 | .000150 | ..... | ..... | |
| 7,400 | 37,000 | .002000 | .000350 | ..... | ..... | |
| 7,600 | 38,000 | .002650 | .000650 | ..... | ..... | |
| 7,800 | 39,000 | .003500 | .000850 | ..... | ..... | |
| 8,000 | 40,000 | .004200 | .000700 | ..... | ..... | |
| 8,400 | 42,000 | .005950 | .001750 | ..... | ..... | |
| 8,800 | 44,000 | .007450 | .001500 | ..... | ..... | |
| 9,200 | 46,000 | .009500 | .002050 | ..... | ..... | |
| 9,600 | 48,000 | .011250 | .001750 | ..... | ..... | |
| 10,000 | 50,000 | .013250 | .002000 | ..... | ..... | |
| 10,400 | 52,000 | .015500 | .002250 | ..... | ..... | |
| 10,800 | 54,000 | .017750 | .002250 | ..... | ..... | |
| 11,200 | 56,000 | .020300 | .002550 | ..... | ..... | |
| 11,600 | 58,000 | .022900 | .002600 | ..... | ..... | |
| 12,000 | 60,000 | .025750 | .002850 | ..... | ..... | |
| 19,800 | 64,000 | .0300 | .004250 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,000 |
| Elastic limit per square inch of original section | do... | 34,000 |
| Elongation per inch after rupture | inch.. | .0700 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".2 from neck |
| Character of broken surface | | granular 80 per cent, dull silky 20 per cent |
| Elongation of inch sections | | ".08", ".06 |

## No. 6061.

Marks, 5090.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000300 | 0. | ..... | |
| 7,800 | 39,000 | .001500 | .000500 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001650 | .000150 | ..... | ..... | |
| 8,200 | 41,000 | .001950 | .000300 | ..... | ..... | |
| 8,400 | 42,000 | .004500 | .002550 | ..... | ..... | |
| 8,600 | 43,000 | .007150 | .002650 | ..... | ..... | |
| 8,800 | 44,000 | .008300 | .001150 | ..... | ..... | |
| 9,200 | 46,000 | .009900 | .001600 | ..... | ..... | |
| 9,600 | 48,000 | .011750 | .001850 | ..... | ..... | |
| 10,000 | 50,000 | .013800 | .002050 | ..... | ..... | |
| 10,400 | 52,000 | .015650 | .001850 | ..... | ..... | |
| 10,800 | 54,000 | .017500 | .001850 | ..... | ..... | |
| 11,200 | 56,000 | .019750 | .002250 | ..... | ..... | |
| 11,600 | 58,000 | .021600 | .001850 | ..... | ..... | |
| 12,000 | 60,000 | .024300 | .002700 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0057 | ..... | ..... | |
| 13,600 | 68,000 | .0350 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0400 | .0050 | ..... | ..... | |
| 15,200 | 76,000 | .0500 | .0100 | ..... | ..... | |
| 15,890 | 79,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 79,450 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .0700 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granular, dull silky spot at circumference |
| Elongation of inch sections | | ".07⁰, ".97 |

## 1,000-Pound Shells.

### No. 5979.

Marks, 4933.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000050 | .000050 | 0. | ..... | |
| 2,000 | 10,000 | .000100 | .000050 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000650 | .000100 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000300 | 0. | ..... | |
| 7,200 | 36,000 | .001150 | .000200 | ..... | ..... | |
| 7,400 | 37,000 | .001200 | .000050 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001500 | .000300 | ..... | ..... | |
| 7,800 | 39,000 | .001950 | .000450 | ..... | ..... | |
| 8,000 | 40,000 | .005450 | .003500 | .003950 | .003950 | |
| 8,200 | 41,000 | .006400 | .000950 | ..... | ..... | |
| 8,400 | 42,000 | .007600 | .001200 | ..... | ..... | |
| 8,800 | 44,000 | .009400 | .001800 | ..... | ..... | |
| 9,200 | 46,000 | .011500 | .002100 | ..... | ..... | |
| 9,600 | 48,000 | .013400 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .015600 | .002200 | ..... | ..... | |
| 10,400 | 52,000 | .017600 | .002000 | ..... | ..... | |
| 10,800 | 54,000 | .020000 | .002400 | ..... | ..... | |
| 11,200 | 56,000 | .022500 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .025000 | .002500 | ..... | ..... | |
| 12,000 | 60,000 | .028050 | .003050 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .006950 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0750 | .0200 | ..... | ..... | |
| 15,820 | 79,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 79,100 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .1050 |
| Elongation per inch under strain at elastic limit | do... | .001200 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granular, dull silky spot at the circumference |
| Elongation of inch sections | | ".10, ".11* |

## No. 5980.

Marks, 4942.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000100 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000500 | ..... | ..... | |
| 8,600 | 43,000 | .001550 | .000100 | ..... | ..... | Elastic limit. |
| 8,800 | 44,000 | .001700 | .000150 | ..... | ..... | |
| 9,000 | 45,000 | .008750 | .007050 | ..... | ..... | |
| 9,200 | 46,000 | .009600 | .000850 | ..... | ..... | |
| 9,400 | 47,000 | .010250 | .000650 | ..... | ..... | |
| 9,600 | 48,000 | .011250 | .001000 | ..... | ..... | |
| 9,800 | 49,000 | .012250 | .001000 | ..... | ..... | |
| 10,000 | 50,000 | .012900 | .000650 | ..... | ..... | |
| 10,400 | 52,000 | .015500 | .002600 | ..... | ..... | |
| 10,800 | 54,000 | .017000 | .001500 | ..... | ..... | |
| 11,200 | 56,000 | .019250 | .002250 | ..... | ..... | |
| 11,600 | 58,000 | .022000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .024500 | .002500 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0055 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 14,940 | 74,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 74,700 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .0600 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".25 from neck |
| Character of broken surface | | granular 40 per cent, dull silky, 60 per cent |
| Elongation of inch sections | | ".05, ".07* |

## No. 5981.

**Marks, 4950.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | 0. | ..... | |
| 8,000 | 40,000 | .001450 | .000450 | ..... | ..... | Elastic limit. |
| 8,200 | 41,000 | .001600 | .000150 | ..... | ..... | |
| 8,400 | 42,000 | .001950 | .000350 | ..... | ..... | |
| 8,600 | 43,000 | .008400 | .006450 | ..... | ..... | |
| 8,800 | 44,000 | .009000 | .000600 | ..... | ..... | |
| 9,000 | 45,000 | .009750 | .000750 | ..... | ..... | |
| 9,200 | 46,000 | .010900 | .001150 | ..... | ..... | |
| 9,600 | 48,000 | .013000 | .002100 | ..... | ..... | |
| 10,000 | 50,000 | .015000 | .002000 | ..... | ..... | |
| 10,400 | 52,000 | .017400 | .002400 | ..... | ..... | |
| 10,800 | 54,000 | .019000 | .001600 | ..... | ..... | |
| 11,200 | 56,000 | .022000 | .003000 | ..... | ..... | |
| 11,600 | 58,000 | .024650 | .002650 | ..... | ..... | |
| 12,000 | 60,000 | .027900 | .003250 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0071 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0700 | .0150 | ..... | ..... | |
| 15,280 | 76,400 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,400 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".25 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".08, ".09* |

## No. 5982.

Marks, 4957.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | | |
| 2,000 | 10,000 | .000300 | .000200 | | | |
| 3,000 | 15,000 | .000450 | .000150 | | | |
| 4,000 | 20,000 | .000600 | .000150 | | | |
| 5,000 | 25,000 | .000800 | .000200 | | | |
| 6,000 | 30,000 | .001000 | .000200 | .000050 | .000050 | |
| 6,600 | 33,000 | .001150 | .000150 | | | |
| 6,800 | 34,000 | .001200 | .000050 | | | |
| 7,000 | 35,000 | .001300 | .000100 | | | |
| 7,200 | 36,000 | .001350 | .000050 | | | |
| 7,400 | 37,000 | .001400 | .000050 | | | |
| 7,600 | 38,000 | .001450 | .000050 | | | Elastic limit. |
| 7,800 | 39,000 | .001650 | .000200 | | | |
| 8,000 | 40,000 | .001800 | .000150 | | | |
| 8,200 | 41,000 | .001950 | .000150 | | | |
| 8,400 | 42,000 | .002200 | .000250 | | | |
| 8,600 | 43,000 | .002850 | .000650 | | | |
| 8,800 | 44,000 | .003400 | .000550 | | | |
| 9,000 | 45,000 | .004000 | .000600 | | | |
| 9,200 | 46,000 | .004550 | .000550 | | | |
| 9,600 | 48,000 | .006100 | .001550 | | | |
| 10,000 | 50,000 | .007950 | .001850 | | | |
| 10,400 | 52,000 | .009000 | .001050 | | | |
| 10,800 | 54,000 | .011100 | .002100 | | | |
| 11,200 | 56,000 | .013000 | .001900 | | | |
| 11,600 | 58,000 | .014750 | .001750 | | | |
| 12,000 | 60,000 | .017150 | .002400 | | | |
| 12,800 | 64,000 | .0250 | .007850 | | | |
| 13,600 | 68,000 | .0300 | .0050 | | | |
| 14,400 | 72,000 | .0350 | .0050 | | | |
| 15,200 | 76,000 | .0450 | .0100 | | | |
| 15,610 | 78,050 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,050 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .0500 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ".85 from neck |
| Character of broken surface | | granular, varying in size |
| Elongation of inch sections | | ".04, ".06 |

## No. 5983.

Marks, 4964.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 3,000 | 15,000 | .000500 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000850 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000150 | 0. | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | |
| 7,200 | 36,000 | .001300 | .000100 | ..... | ..... | |
| 7,400 | 37,000 | .001450 | .000150 | ..... | ..... | |
| 7,600 | 38,000 | .001500 | .000050 | ..... | ..... | |
| 7,800 | 39,000 | .001600 | .000100 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001850 | .000250 | ..... | ..... | |
| 8,200 | 41,000 | .002100 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .002500 | .000400 | ..... | ..... | |
| 8,600 | 43,000 | .002950 | .000450 | ..... | ..... | |
| 8,800 | 44,000 | .003600 | .000650 | ..... | ..... | |
| 9,000 | 45,000 | .004100 | .000500 | ..... | ..... | |
| 9,200 | 46,000 | .005000 | .000900 | ..... | ..... | |
| 9,600 | 48,000 | .006500 | .001500 | ..... | ..... | |
| 10,000 | 50,000 | .008050 | .001550 | ..... | ..... | |
| 10,400 | 52,000 | .009500 | .001450 | ..... | ..... | |
| 10,800 | 54,000 | .011250 | .001750 | ..... | ..... | |
| 11,200 | 56,000 | .013050 | .001800 | ..... | ..... | |
| 11,600 | 58,000 | .015000 | .001950 | ..... | ..... | |
| 12,000 | 60,000 | .017000 | .002000 | ..... | ..... | |
| 12,800 | 64,000 | .0200 | .0030 | ..... | ..... | |
| 13,600 | 68,000 | .0250 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0350 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0450 | .0100 | ..... | ..... | |
| 15,540 | 77,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,700 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .0450 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | granular, varying in size |
| Elongation of inch sections | | ".04, ".05* |

## No. 5984.

Marks, 4972.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000200 | .000100 | ..... | ..... | |
| 3,000 | 15,000 | .000400 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000150 | ..... | ..... | |
| 5,000 | 25,000 | .000700 | .000150 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000250 | 0. | ..... | |
| 7,400 | 37,000 | .001300 | .000350 | ..... | ..... | |
| 7,600 | 38,000 | .001350 | .000050 | ..... | ..... | |
| 7,800 | 39,000 | .001400 | .000050 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001600 | .000200 | ..... | ..... | |
| 8,200 | 41,000 | .001850 | .000250 | ..... | ..... | |
| 8,400 | 42,000 | .002050 | .000200 | ..... | ..... | |
| 8,600 | 43,000 | .002450 | .000400 | ..... | ..... | |
| 8,800 | 44,000 | .002950 | .000500 | ..... | ..... | |
| 9,000 | 45,000 | .003400 | .000450 | ..... | ..... | |
| 9,200 | 46,000 | .004200 | .000800 | ..... | ..... | |
| 9,600 | 48,000 | .005900 | .001700 | ..... | ..... | |
| 10,000 | 50,000 | .007400 | .001500 | ..... | ..... | |
| 10,400 | 52,000 | .009000 | .001600 | ..... | ..... | |
| 10,800 | 54,000 | .010700 | .001700 | ..... | ..... | |
| 11,200 | 56,000 | .012400 | .001700 | ..... | ..... | |
| 11,600 | 58,000 | .014150 | .001750 | ..... | ..... | |
| 12,000 | 60,000 | .016550 | .002400 | ..... | ..... | |
| 12,800 | 64,000 | .0200 | .003450 | ..... | ..... | |
| 13,600 | 68,000 | .0250 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0350 | .0100 | ..... | ..... | |
| 15,100 | 75,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 75,500 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .0400 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ″.30 from neck |
| Character of broken surface | | granular, varying in size |
| Elongation of inch sections | | ″.04, ″.04* |

## No. 5989.

Marks, 5014.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | | |
| 2,000 | 10,000 | .000350 | .000250 | | | |
| 4,000 | 20,000 | .000650 | .000300 | | | |
| 6,000 | 30,000 | .001050 | .000400 | 0. | | |
| 8,000 | 40,000 | .001600 | .000550 | | | Elastic limit. |
| 8,200 | 41,000 | .002000 | .000400 | | | |
| 8,400 | 42,000 | .009500 | .007500 | | | |
| 8,600 | 43,000 | .010000 | .000500 | | | |
| 8,800 | 44,000 | .010500 | .000500 | | | |
| 9,200 | 46,000 | .011750 | .001250 | | | |
| 9,600 | 48,000 | .014500 | .002750 | | | |
| 10,000 | 50,000 | .016500 | .002000 | | | |
| 10,400 | 52,000 | .018600 | .002100 | | | |
| 10,800 | 54,000 | .020750 | .002150 | | | |
| 11,200 | 56,000 | .024000 | .003250 | | | |
| 11,600 | 58,000 | .026500 | .002500 | | | |
| 12,000 | 60,000 | .029750 | .003250 | | | |
| 12,400 | 62,000 | .033250 | .003500 | | | |
| 12,800 | 64,000 | .037000 | .003750 | | | |
| 13,200 | 66,000 | .042000 | .005000 | | | |
| 13,600 | 68,000 | .048750 | .006750 | | | |
| 14,120 | 70,600 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 70,600 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .0650 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ″.05 from neck |
| Character of broken surface | | granular 40 per cent, dull silky 60 per cent |
| Elongation of inch sections | | ″.08*, ″.05 |

## No. 5990.

Marks, 5020.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000350 | 0. | ..... | |
| 7,000 | 35,000 | .001400 | .000350 | ..... | ..... | |
| 7,200 | 36,000 | .001450 | .000050 | ..... | ..... | |
| 7,400 | 37,000 | .001500 | .000050 | ..... | ..... | |
| 7,600 | 38,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001800 | .000250 | ..... | ..... | |
| 8,000 | 40,000 | .002000 | .000200 | ..... | ..... | |
| 8,200 | 41,000 | .006500 | .004500 | ..... | ..... | |
| 8,400 | 42,000 | .007900 | .001400 | ..... | ..... | |
| 8,800 | 44,000 | .010000 | .002100 | ..... | ..... | |
| 9,200 | 46,000 | .011750 | .001750 | ..... | ..... | |
| 9,600 | 48,000 | .013750 | .002000 | ..... | ..... | |
| 10,000 | 50,000 | .016000 | .002250 | ..... | ..... | |
| 10,400 | 52,000 | .018100 | .002100 | ..... | ..... | |
| 10,800 | 54,000 | .020500 | .002400 | ..... | ..... | |
| 11,200 | 56,000 | .023250 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .026000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .029550 | .003550 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .010450 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0100 | ..... | ..... | |
| 14,510 | 72,550 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 72,550 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .0600 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | granular 50 per cent, dull silky 50 per cent |
| Elongation of inch sections | | ".09", ".07 |

## No. 5991.

Marks, 5037.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 7,600 | 38,000 | .001550 | .000550 | ..... | ..... | |
| 7,800 | 39,000 | .001600 | .000050 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001850 | .000250 | ..... | ..... | |
| 8,200 | 41,000 | .002500 | .000650 | ..... | ..... | |
| 8,400 | 42,000 | .007500 | .005000 | ..... | ..... | |
| 8,600 | 43,000 | .008500 | .001000 | ..... | ..... | |
| 8,800 | 44,000 | .009500 | .001000 | ..... | ..... | |
| 9,200 | 46,000 | .011250 | .001750 | ..... | ..... | |
| 9,600 | 48,000 | .013150 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .015500 | .002350 | ..... | ..... | |
| 10,400 | 52,000 | .017300 | .001800 | ..... | ..... | |
| 10,800 | 54,000 | .019500 | .002200 | ..... | ..... | |
| 11,200 | 56,000 | .022250 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .024400 | .002150 | ..... | ..... | |
| 12,000 | 60,000 | .027500 | .003100 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0075 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0050 | ..... | ..... | |
| 15,200 | 76,000 | .0700 | .0200 | ..... | ..... | |
| 16,000 | 80,000 | .1000 | .0300 | ..... | ..... | |
| 16,020 | 80,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,100 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1050 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".8 from neck |
| Character of broken surface | | granular, dull silky spot at the circumference |
| Elongation of inch sections | | ".10, ".11* |

## No. 5992.

Marks, 5044.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001550 | .000550 | ..... | ..... | |
| 8,200 | 41,000 | .001650 | .000100 | ..... | ..... | Elastic limit |
| 8,400 | 42,000 | .002000 | .000350 | ..... | ..... | |
| 8,600 | 43,000 | .007500 | .005500 | ..... | ..... | |
| 8,800 | 44,000 | .008750 | .001250 | ..... | ..... | |
| 9,000 | 45,000 | .009250 | .000500 | ..... | ..... | |
| 9,200 | 46,000 | .010050 | .000800 | ..... | ..... | |
| 9,600 | 48,000 | .012250 | .002200 | ..... | ..... | |
| 10,000 | 50,000 | .014000 | .001750 | ..... | ..... | |
| 10,400 | 52,000 | .016000 | .002000 | ..... | ..... | |
| 10,800 | 54,000 | .018100 | .002100 | ..... | ..... | |
| 11,200 | 56,000 | .020600 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .023000 | .002400 | ..... | ..... | |
| 12,000 | 60,000 | .025650 | .002650 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .009350 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0650 | .0150 | ..... | ..... | |
| 16,000 | 80,000 | .0850 | .0200 | ..... | ..... | |
| 16,410 | 82,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 82,050 |
| Elastic limit per square inch of original section | do... | 41,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.3 from neck |
| Character of broken surface | | granular 80 per cent, dull silky 20 per cent |
| Elongation of inch sections | | ″.13*, ″.11 |

No. 5993.

Marks, 5050.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,800 | 39,000 | .001600 | .000600 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .002250 | .000650 | ..... | ..... | |
| 8,200 | 41,000 | .008000 | .005750 | ..... | ..... | |
| 8,400 | 42,000 | .009000 | .001000 | ..... | ..... | |
| 8,600 | 43,000 | .010000 | .001000 | ..... | ..... | |
| 8,800 | 44,000 | .010500 | .000500 | ..... | ..... | |
| 9,200 | 46,000 | .012600 | .002100 | ..... | ..... | |
| 9,600 | 48,000 | .014500 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .016500 | .002000 | ..... | ..... | |
| 10,400 | 52,000 | .019400 | .002900 | ..... | ..... | |
| 10,800 | 54,000 | .021900 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .024250 | .002350 | ..... | ..... | |
| 11,600 | 58,000 | .027000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .030400 | .003400 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0096 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0800 | .0200 | ..... | ..... | |
| 15,960 | 79,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 79,800 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ″.9 from neck |
| Character of broken surface | | granular, silky spot at the circumference |
| Elongation of inch sections | | ″.13*, ″.11 |

## No. 5994.

Marks, 5057.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001500 | .000500 | ..... | ..... | |
| 8,600 | 43,000 | .001750 | .000250 | ..... | ..... | Elastic limit. |
| 8,800 | 44,000 | .001850 | .000100 | ..... | ..... | |
| 9,000 | 45,000 | .001950 | .000100 | ..... | ..... | |
| 9,200 | 46,000 | .010500 | .008550 | ..... | ..... | |
| 9,400 | 47,000 | .011000 | .000500 | ..... | ..... | |
| 9,600 | 48,000 | .011400 | .000400 | ..... | ..... | |
| 9,800 | 49,000 | .011650 | .000250 | ..... | ..... | |
| 10,000 | 50,000 | .012150 | .000500 | ..... | ..... | |
| 10,400 | 52,000 | .014000 | .001850 | ..... | ..... | |
| 10,800 | 54,000 | .016500 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .019000 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .021250 | .002200 | ..... | ..... | |
| 12,000 | 60,000 | .023500 | .002250 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0065 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0450 | .0050 | ..... | ..... | |
| 15,200 | 76,000 | .0600 | .0150 | ..... | ..... | |
| 16,000 | 80,000 | .0800 | .0200 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,000 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".35 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".05, ".08 |

## No. 5995.

Marks, 5070.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | .000050 | .000050 | |
| 7,800 | 39,000 | .001550 | .000550 | ..... | ..... | |
| 8,000 | 40,000 | .001600 | .000050 | ..... | ..... | Elastic limit. |
| 8,200 | 41,000 | .008000 | .006400 | ..... | ..... | |
| 8,400 | 42,000 | .008650 | .000650 | ..... | ..... | |
| 8,600 | 43,000 | .009250 | .000600 | ..... | ..... | |
| 8,800 | 44,000 | .010250 | .001000 | ..... | ..... | |
| 9,200 | 46,000 | .012250 | .002000 | ..... | ..... | |
| 9,600 | 48,000 | .014000 | .001750 | ..... | ..... | |
| 10,000 | 50,000 | .015750 | .001750 | ..... | ..... | |
| 10,400 | 52,000 | .018150 | .002400 | ..... | ..... | |
| 10,800 | 54,000 | .021000 | .002850 | ..... | ..... | |
| 11,200 | 56,000 | .023600 | .002600 | ..... | ..... | |
| 11,600 | 58,000 | .026500 | .002900 | ..... | ..... | |
| 12,000 | 60,000 | .029500 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0105 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0800 | .0200 | ..... | ..... | |
| 16,000 | 80,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 80,000 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .035 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".55 from neck |
| Character of broken surface | | granular, dull silky spot at circumference |
| Elongation of inch sections | | ".11, ".13* |

## No. 5996.

Marks, 5077.
Diameters, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | 0. | ..... | |
| 7,600 | 38,000 | .001600 | .000550 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001800 | .000200 | ..... | ..... | |
| 8,000 | 40,000 | .002000 | .000200 | ..... | ..... | |
| 8,200 | 41,000 | .002500 | .000500 | ..... | ..... | |
| 8,400 | 42,000 | .007500 | .005000 | ..... | ..... | |
| 8,600 | 43,000 | .008850 | .001350 | ..... | ..... | |
| 8,800 | 44,000 | .009500 | .000650 | ..... | ..... | |
| 9,200 | 46,000 | .011250 | .001750 | ..... | ..... | |
| 9,600 | 48,000 | .013300 | .002050 | ..... | ..... | |
| 10,000 | 50,000 | .015250 | .001950 | ..... | ..... | |
| 10,400 | 52,000 | .017250 | .002000 | ..... | ..... | |
| 10,800 | 54,000 | .020000 | .002750 | ..... | ..... | |
| 11,200 | 56,000 | .022650 | .002650 | ..... | ..... | |
| 11,600 | 58,000 | .025500 | .002850 | ..... | ..... | |
| 12,000 | 60,000 | .028500 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0115 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0750 | .0200 | ..... | ..... | |
| 15,720 | 78,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,600 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch... | .1000 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction of area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | 25". from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".09, ".11* |

## No. 5997.

Marks, 5083.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | .000050 | .000050 | |
| 8,000 | 40,000 | .001500 | .000500 | ..... | ..... | |
| 8,200 | 41,000 | .001550 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001600 | .000050 | ..... | ..... | Elastic limit. |
| 8,600 | 43,000 | .001850 | .000250 | ..... | ..... | |
| 8,800 | 44,000 | .008250 | .006400 | ..... | ..... | |
| 9,000 | 45,000 | .009500 | .001250 | ..... | ..... | |
| 9,200 | 46,000 | .010500 | .001000 | ..... | ..... | |
| 9,600 | 48,000 | .012400 | .001900 | ..... | ..... | |
| 10,000 | 50,000 | .014500 | .002100 | ..... | ..... | |
| 10,400 | 52,000 | .016100 | .001600 | ..... | ..... | |
| 10,800 | 54,000 | .018500 | .002400 | ..... | ..... | |
| 11,200 | 56,000 | .021000 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .023500 | .002500 | ..... | ..... | |
| 12,000 | 60,000 | .026650 | .003150 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .008350 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0050 | ..... | ..... | |
| 14,900 | 74,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 74,500 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .0650 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".08*, ".05 |

## No. 5998.

Marks, 5097.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 7,400 | 37,000 | .001450 | .000450 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001600 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .002400 | .000800 | ..... | ..... | |
| 8,000 | 40,000 | .006500 | .004100 | ..... | ..... | |
| 8,200 | 41,000 | .008500 | .002000 | ..... | ..... | |
| 8,400 | 42,000 | .009300 | .000800 | ..... | ..... | |
| 8,800 | 44,000 | .011150 | .001180 | ..... | ..... | |
| 9,200 | 46,000 | .013500 | .002350 | ..... | ..... | |
| 9,600 | 48,000 | .015500 | .002000 | ..... | ..... | |
| 10,000 | 50,000 | .017650 | .002150 | ..... | ..... | |
| 10,400 | 52,000 | .019750 | .002100 | ..... | ..... | |
| 10,800 | 54,000 | .022900 | .003150 | ..... | ..... | |
| 11,200 | 56,000 | .025150 | .002250 | ..... | ..... | |
| 11,600 | 58,000 | .028250 | .003100 | ..... | ..... | |
| 12,000 | 60,000 | .031900 | .003650 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0081 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0650 | .0150 | ..... | ..... | |
| 15,200 | 76,000 | .0900 | .0250 | ..... | ..... | |
| 15,780 | 78,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,900 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .1350 |
| Elongation per inch under strain at elastic limit | do... | .001450 |
| Reduction in diameter at point of rupture | do... | .045 |
| Reduction in area after rupture, per cent of original section | | 16.9 |
| Position of rupture | | ".45 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".16[2], ".11 |

## No. 5999.

Marks, 5104.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 6,600 | 33,000 | .001250 | .000250 | ..... | ..... | Elastic limit. |
| 6,800 | 34,000 | .001400 | .000150 | ..... | ..... | |
| 7,000 | 35,000 | .001600 | .000200 | ..... | ..... | |
| 7,200 | 36,000 | .002600 | .001000 | ..... | ..... | |
| 7,400 | 37,000 | .003750 | .001150 | ..... | ..... | |
| 7,600 | 38,000 | .005000 | .001250 | ..... | ..... | |
| 7,800 | 39,000 | .005900 | .000900 | ..... | ..... | |
| 8,000 | 40,000 | .006900 | .001000 | ..... | ..... | |
| 8,400 | 42,000 | .008650 | .001750 | ..... | ..... | |
| 8,800 | 44,000 | .010500 | .001850 | ..... | ..... | |
| 9,200 | 46,000 | .012750 | .002250 | ..... | ..... | |
| 9,600 | 48,000 | .014500 | .001750 | ..... | ..... | |
| 10,000 | 50,000 | .017000 | .002500 | ..... | ..... | |
| 10,400 | 52,000 | .018900 | .001900 | ..... | ..... | |
| 10,800 | 54,000 | .021750 | .002850 | ..... | ..... | |
| 11,200 | 56,000 | .024150 | .002400 | ..... | ..... | |
| 11,600 | 58,000 | .027650 | .003500 | ..... | ..... | |
| 12,000 | 60,000 | .032000 | .004350 | ..... | ..... | |
| 15,200 | 76,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,000 |
| Elastic limit per square inch of original section | do... | 33,000 |
| Elongation per inch after rupture | inch.. | .1000 |
| Elongation per inch under strain at elastic limit | do... | .001250 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | granular |
| Elongation of inch sections | | ".10, ".10 |

## No. 6000.

Marks, 5109.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,000 | 35,000 | .001300 | .000300 | ..... | ..... | |
| 7,200 | 36,000 | .001400 | .000100 | ..... | ..... | |
| 7,400 | 37,000 | .001450 | .000050 | ..... | ..... | |
| 7,600 | 38,000 | .001500 | .000050 | ..... | ..... | |
| 7,800 | 39,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001700 | .000150 | ..... | ..... | |
| 8,200 | 41,000 | .001850 | .000150 | ..... | ..... | |
| 8,400 | 42,000 | .009400 | .007550 | ..... | ..... | |
| 8,600 | 43,000 | .010500 | .001100 | ..... | ..... | |
| 8,800 | 44,000 | .011400 | .000900 | ..... | ..... | |
| 9,200 | 46,000 | .013150 | .001750 | ..... | ..... | |
| 9,600 | 48,000 | .015500 | .002350 | ..... | ..... | |
| 10,000 | 50,000 | .018000 | .002500 | ..... | ..... | |
| 10,400 | 52,000 | .020100 | .002100 | ..... | ..... | |
| 10,800 | 54,000 | .023150 | .003050 | ..... | ..... | |
| 11,200 | 56,000 | .025600 | .002450 | ..... | ..... | |
| 11,600 | 58,000 | .028750 | .003150 | ..... | ..... | |
| 12,000 | 60,000 | .032500 | .003750 | ..... | ..... | |
| 12,800 | 64,000 | .0450 | .0125 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0650 | .0150 | ..... | ..... | |
| 15,120 | 75,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 75,600 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1050 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | granular, 40 per cent, dull silky 60 per cent |
| Elongation of inch sections | | ".09, ".12" |

No. 6006.

Marks, 5063.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,000 | 35,000 | .001150 | .000150 | ..... | ..... | |
| 7,600 | 38,000 | .001300 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .001350 | .000050 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001650 | .000300 | ..... | ..... | |
| 8,200 | 41,000 | .006500 | .004850 | ..... | ..... | |
| 8,400 | 42,000 | .007950 | .001450 | ..... | ..... | |
| 8,800 | 44,000 | .009500 | .001550 | ..... | ..... | |
| 9,200 | 46,000 | .011900 | .002400 | ..... | ..... | |
| 9,600 | 48,000 | .013950 | .002050 | ..... | ..... | |
| 10,000 | 50,000 | .015900 | .001950 | ..... | ..... | |
| 10,400 | 52,000 | .017600 | .001700 | ..... | ..... | |
| 10,800 | 54,000 | .020000 | .002400 | ..... | ..... | |
| 11,200 | 56,000 | .022500 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .025300 | .002800 | ..... | ..... | |
| 12,000 | 60,000 | .028350 | .003050 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .011650 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0750 | .0200 | ..... | ..... | |
| 15,920 | 79,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 79,600 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1000 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".3 from neck |
| Character of broken surface | | granular 85 per cent, dull silky 15 per cent. |
| Elongation of inch sections | | ".12*, ".08 |

## No. 6007.

Marks, 5090.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | |
| 1,000 | 5,000 | .000200 | .000200 | ..... | ..... | Initial load. |
| 2,000 | 10,000 | .000450 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000850 | .000400 | ..... | ..... | |
| 6,000 | 30,000 | .001150 | .000300 | 0. | ..... | |
| 7,000 | 35,000 | .001350 | .000200 | ..... | ..... | |
| 7,800 | 39,000 | .001500 | .000150 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .001850 | .000350 | ..... | ..... | |
| 8,200 | 41,000 | .002550 | .000700 | ..... | ..... | |
| 8,400 | 42,000 | .004500 | .001950 | ..... | ..... | |
| 8,600 | 43,000 | .007500 | .003000 | ..... | ..... | |
| 8,800 | 44,000 | .008450 | .000900 | ..... | ..... | |
| 9,200 | 46,000 | .010500 | .002050 | ..... | ..... | |
| 9,600 | 48,000 | .012100 | .001600 | ..... | ..... | |
| 10,000 | 50,000 | .013750 | .001650 | ..... | ..... | |
| 10,400 | 52,000 | .016000 | .002250 | ..... | ..... | |
| 10,800 | 54,000 | .017800 | .001800 | ..... | ..... | |
| 11,200 | 56,000 | .019900 | .002100 | ..... | ..... | |
| 11,600 | 58,000 | .022400 | .002500 | ..... | ..... | |
| 12,000 | 60,000 | .025500 | .003100 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0095 | ..... | ..... | |
| 13,600 | 68,000 | .0400 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0500 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0600 | .0100 | ..... | ..... | |
| 16,000 | 80,000 | .0800 | .0200 | ..... | ..... | |
| 16,700 | 83,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 83,500 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .1200 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .085 |
| Reduction in area after rupture, per cent of original section | | 13.2 |
| Position of rupture | | ".45 from neck |
| Character of broken surface | | granular 85 per cent, dull silky 15 per cent |
| Elongation of inch sections | | ".11, ".13* |

## No. 6108.

Marks, 5110.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000800 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000850 | 0. | ..... | |
| 7,000 | 35,000 | .001300 | .000800 | ..... | ..... | |
| 8,000 | 40,000 | .001500 | .000200 | ..... | ..... | |
| 8,400 | 42,000 | .001650 | .000150 | ..... | ..... | Elastic limit. |
| 8,600 | 43,000 | .002000 | .000350 | ..... | ..... | |
| 8,800 | 44,000 | .005000 | .003000 | ..... | ..... | |
| 9,000 | 45,000 | .008900 | .003900 | ..... | ..... | |
| 9,200 | 46,000 | .009850 | .000950 | ..... | ..... | |
| 9,600 | 48,000 | .011400 | .001550 | ..... | ..... | |
| 10,000 | 50,000 | .013250 | .001850 | ..... | ..... | |
| 10,400 | 52,000 | .015400 | .002150 | ..... | ..... | |
| 10,800 | 54,000 | .017350 | .001950 | ..... | ..... | |
| 11,200 | 56,000 | .019350 | .002000 | ..... | ..... | |
| 11,600 | 58,000 | .021650 | .002300 | ..... | ..... | |
| 12,000 | 60,000 | .024400 | .002750 | ..... | ..... | |
| 12,800 | 64,000 | .0300 | .0056 | ..... | ..... | |
| 13,600 | 68,000 | .0350 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0450 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0550 | .0100 | ..... | ..... | |
| 16,000 | 80,000 | .0750 | .0200 | ..... | ..... | |
| 16,420 | 82,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 82,100 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .1000 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ″.50 from neck |
| Character of broken surface | | granular 85 per cent, fine silky 15 per cent |
| Elongation of inch sections | | ″.08, ″.12* |

## No. 6109.

Marks, 5119.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000250 | .000150 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,000 | 35,000 | .001350 | .000350 | ..... | ..... | |
| 7,200 | 36,000 | .001400 | .000050 | ..... | ..... | Elastic limit. |
| 7,400 | 37,000 | .001550 | .000150 | ..... | ..... | |
| 7,600 | 38,000 | .001700 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .002150 | .000450 | ..... | ..... | |
| 8,000 | 40,000 | .008000 | .005850 | ..... | ..... | |
| 8,400 | 42,000 | .009800 | .001800 | ..... | ..... | |
| 8,800 | 44,000 | .011000 | .001700 | ..... | ..... | |
| 9,200 | 46,000 | .013450 | .002450 | ..... | ..... | |
| 9,600 | 48,000 | .015500 | .002050 | ..... | ..... | |
| 10,000 | 50,000 | .017750 | .002250 | ..... | ..... | |
| 10,400 | 52,000 | .019750 | .002000 | ..... | ..... | |
| 10,800 | 54,000 | .022900 | .003150 | ..... | ..... | |
| 11,200 | 56,000 | .025250 | .002350 | ..... | ..... | |
| 11,600 | 58,000 | .028750 | .003500 | ..... | ..... | |
| 12,000 | 60,000 | .031900 | .003150 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0081 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0900 | .0300 | ..... | ..... | |
| 15,520 | 77,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,600 |
| Elastic limit per square inch of original section | do... | 36,000 |
| Elongation per inch after rupture | inch.. | .1100 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".7 from neck |
| Character of broken surface | | granular 70 per cent, dull silky 30 per cent |
| Elongation of inch sections | | ".10, ".12 |

## No. 6010.

Marks, 5127.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | 0. | ..... | |
| 7,000 | 35,000 | .001100 | .000150 | ..... | ..... | |
| 7,800 | 39,000 | .001350 | .000250 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000100 | ..... | ..... | |
| 8,200 | 41,000 | .001500 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001550 | .000050 | ..... | ..... | Elastic limit. |
| 8,600 | 43,000 | .008600 | .007050 | ..... | ..... | |
| 8,800 | 44,000 | .009150 | .000550 | ..... | ..... | |
| 9,000 | 45,000 | .010100 | .000950 | ..... | ..... | |
| 9,200 | 46,000 | .010850 | .000750 | ..... | ..... | |
| 9,600 | 48,000 | .013000 | .002150 | ..... | ..... | |
| 10,000 | 50,000 | .014900 | .001900 | ..... | ..... | |
| 10,400 | 52,000 | .017000 | .002100 | ..... | ..... | |
| 10,800 | 54,000 | .019000 | .002000 | ..... | ..... | |
| 11,200 | 56,000 | .021550 | .002560 | ..... | ..... | |
| 11,600 | 58,000 | .024500 | .002950 | ..... | ..... | |
| 12,000 | 60,000 | .027400 | .002900 | ..... | ..... | |
| 12,800 | 64,000 | .0350 | .0076 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 14,540 | 72,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 72,700 |
| Elastic limit per square inch of original section | do... | 42,000 |
| Elongation per inch after rupture | inch.. | .0700 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .015 |
| Reduction in area after rupture, per cent of original section | | 5.7 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granular 40 per cent, dull silky 60 per cent |
| Elongation of inch sections | | ".08*, ".06 |

## No. 6011.

Marks, 5134.
Diameter ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | 0. | ..... | |
| 7,000 | 35,000 | .001150 | .000200 | ..... | ..... | |
| 7,200 | 36,000 | .001200 | .000050 | ..... | ..... | |
| 7,400 | 37,000 | .001250 | .000050 | ..... | ..... | Elastic limit. |
| 7,600 | 38,000 | .001350 | .000100 | ..... | ..... | |
| 7,800 | 39,000 | .001500 | .000150 | ..... | ..... | |
| 8,000 | 40,000 | .001650 | .000150 | ..... | ..... | |
| 8,200 | 41,000 | .002700 | .001050 | ..... | ..... | |
| 8,400 | 42,000 | .008800 | .006100 | ..... | ..... | |
| 8,800 | 44,000 | .010550 | .001750 | ..... | ..... | |
| 9,200 | 46,000 | .012400 | .001850 | ..... | ..... | |
| 9,600 | 48,000 | .014400 | .002000 | ..... | ..... | |
| 10,000 | 50,000 | .016550 | .002150 | ..... | ..... | |
| 10,400 | 52,000 | .018900 | .002350 | ..... | ..... | |
| 10,800 | 54,000 | .021400 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .024100 | .002700 | ..... | ..... | |
| 11,600 | 58,000 | .026750 | .002650 | ..... | ..... | |
| 12,000 | 60,000 | .029750 | .003000 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .010250 | ..... | ..... | |
| 13,600 | 68,000 | .0500 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0600 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0800 | .0200 | ..... | ..... | |
| 15,610 | 78,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 78,050 |
| Elastic limit per square inch of original section | do... | 37,000 |
| Elongation per inch after rupture | inch.. | .1050 |
| Elongation per inch under strain at elastic limit | do... | .001250 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".10, ".11* |

## No. 6012.

Marks, 5140.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,000 | 35,000 | .001200 | .000200 | ..... | ..... | |
| 8,000 | 40,000 | .001500 | .000300 | ..... | ..... | Elastic limit. |
| 8,200 | 41,000 | .001900 | .000400 | ..... | ..... | |
| 8,400 | 42,000 | .007250 | .005350 | ..... | ..... | |
| 8,600 | 43,000 | .008450 | .001200 | ..... | ..... | |
| 8,800 | 44,000 | .009350 | .000900 | ..... | ..... | |
| 9,200 | 46,000 | .011000 | .001650 | ..... | ..... | |
| 9,600 | 48,000 | .013000 | .002000 | ..... | ..... | |
| 10,000 | 50,000 | .015000 | .002000 | ..... | ..... | |
| 10,400 | 52,000 | .017250 | .002250 | ..... | ..... | |
| 10,800 | 54,000 | .019500 | .002250 | ..... | ..... | |
| 11,200 | 56,000 | .022250 | .002750 | ..... | ..... | |
| 11,600 | 58,000 | .025000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .027500 | .002500 | ..... | ..... | |
| 12,800 | 64,000 | .0400 | .0125 | ..... | ..... | |
| 13,600 | 68,000 | .0450 | .0050 | ..... | ..... | |
| 14,400 | 72,000 | .0550 | .0100 | ..... | ..... | |
| 15,200 | 76,000 | .0700 | .0150 | ..... | ..... | |
| 15,210 | 76,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,050 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .0800 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | granular, dull silky at circumference |
| Elongation of inch sections | | ".07, ".09* |

## No. 6013.

Marks, 5146.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 7,000 | 35,000 | .001350 | .000350 | ..... | ..... | |
| 7,600 | 38,000 | .001550 | .000200 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001850 | .000300 | ..... | ..... | |
| 8,000 | 40,000 | .007500 | .005650 | ..... | ..... | |
| 8,200 | 41,000 | .008450 | .000950 | ..... | ..... | |
| 8,400 | 42,000 | .009250 | .000800 | ..... | ..... | |
| 8,800 | 44,000 | .011500 | .002250 | ..... | ..... | |
| 9,200 | 46,000 | .013450 | .001950 | ..... | ..... | |
| 9,600 | 48,000 | .015850 | .002400 | ..... | ..... | |
| 10,000 | 50,000 | .018250 | .002400 | ..... | ..... | |
| 10,400 | 52,000 | .020500 | .002250 | ..... | ..... | |
| 10,800 | 54,000 | .023350 | .002850 | ..... | ..... | |
| 11,200 | 56,000 | .026250 | .002900 | ..... | ..... | |
| 11,600 | 58,000 | .029000 | .002750 | ..... | ..... | |
| 12,000 | 60,000 | .033000 | .004000 | ..... | ..... | |
| 12,800 | 64,000 | .0450 | .0120 | ..... | ..... | |
| 13,600 | 68,000 | .0550 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0700 | .0150 | ..... | ..... | |
| 15,020 | 75,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 75,100 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .0950 |
| Elongation per inch under strain at elastic limit | do... | .001550 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".45 from neck |
| Character of broken surface | | granular 60 per cent, dull silky 40 per cent |
| Elongation of inch sections | | ".08, ".11* |

## No. 6062.

**Marks, 5110.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000350 | ..... | ..... | |
| 5,600 | 28,000 | .001000 | .000300 | ..... | ..... | |
| 5,800 | 29,000 | .001100 | .000100 | ..... | ..... | Elastic limit. |
| 6,000 | 30,000 | .001450 | .000350 | .000450 | .000450 | |
| 6,200 | 31,000 | .001600 | .000150 | ..... | ..... | |
| 6,400 | 32,000 | .001850 | .000250 | ..... | ..... | |
| 6,600 | 33,000 | .002000 | .000150 | ..... | ..... | |
| 6,800 | 34,000 | .002100 | .000100 | ..... | ..... | |
| 7,000 | 35,000 | .002200 | .000100 | .001000 | .000550 | |
| 7,200 | 36,000 | .002500 | .000300 | ..... | ..... | |
| 7,400 | 37,000 | .002750 | .000250 | ..... | ..... | |
| 7,600 | 38,000 | .003250 | .000500 | ..... | ..... | |
| 7,800 | 39,000 | .004000 | .000750 | ..... | ..... | |
| 8,000 | 40,000 | .005500 | .001500 | ..... | ..... | |
| 8,400 | 42,000 | .007250 | .001750 | ..... | ..... | |
| 8,800 | 44,000 | .009750 | .002500 | ..... | ..... | |
| 9,200 | 46,000 | .011550 | .001800 | ..... | ..... | |
| 9,600 | 48,000 | .013500 | .001950 | ..... | ..... | |
| 10,000 | 50,000 | .015400 | .001900 | ..... | ..... | |
| 10,400 | 52,000 | .017500 | .002100 | ..... | ..... | |
| 10,800 | 54,000 | .020000 | .002500 | ..... | ..... | |
| 11,200 | 56,000 | .022500 | .002500 | ..... | ..... | |
| 11,600 | 58,000 | .024500 | .002000 | ..... | ..... | |
| 12,000 | 60,000 | .027650 | .003150 | ..... | ..... | |
| 15,200 | 76,000 | .0600 | .032350 | ..... | ..... | |
| 15,920 | 79,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 79,600 |
| Elastic limit per square inch of original section | do... | 29,000 |
| Elongation per inch after rupture | inch.. | .0900 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .025 |
| Reduction in area after rupture, per cent of original section | | 9.5 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | granular, dull silky spot at the circumference |
| Elongation of inch sections | | ".07, ".11* |

*TABULATION OF TENSION SPECIMENS FROM CAST-STEEL BODIES OF 800 AND 1,000 POUND B. L. MORTAR SHELLS. (STEMS 2" LONG.)*

800-POUND SHELLS.

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation in 2 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. in.* | *Pounds.* | *Pounds.* | *Per ct.* | *Per ct.* | | *Inch.* |
| 6035 | 5158 | .505 | .20 | 38,000 | 68,000 | 6.0 | 5.7 | Granular 40 per cent, dull silky 60 per cent | .05, .07* |
| 6036 | 5161 | .505 | .20 | 39,000 | 78,600 | 9.5 | 9.5 | Granular 85 per cent, dull silky 15 per cent | .11*, .08 |
| 6037 | 6087 | .505 | .20 | 38,000 | 78,050 | 12.5 | 13.2 | Dull silky | .11, .14* |
| 6038 | 5173 | .505 | .20 | 37,000 | 78,650 | 11.5 | 9.5 | Granular 85 per cent, dull silky 15 per cent | .10, .13* |
| 6039 | 5181 | .505 | .20 | 39,000 | 77,700 | 13.0 | 13.2 | Granular 80 per cent, dull silky 20 per cent | .11, .15* |
| 6040 | 5188 | .505 | .20 | 38,000 | 78,150 | 15.0 | 16.9 | Granular 40 per cent, dull silky 60 per cent | .14, .16* |
| 6041 | 5195 | .505 | .20 | 39,000 | 79,300 | 12.0 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .12, .12 |
| 6042 | 5202 | .505 | .20 | 34,000 | 80,000 | 12.5 | 13.2 | Granular | .14*, .11 |
| 6043 | 5210 | .505 | .20 | 40,000 | 76,000 | 8.5 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .09*, .08 |
| 6044 | 5217 | .505 | .20 | 43,000 | 76,000 | 8.0 | 9.5 | Granular 40 per cent, dull silky 60 per cent | .09*, .07 |
| 6045 | 5224 | .505 | .20 | 40,000 | 78,350 | 8.0 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .07, .09* |
| 6046 | 5233 | .505 | .20 | 42,000 | 72,100 | 7.5 | 9.5 | Granular 40 per cent, dull silky 60 per cent | .05, .08* |
| 6047 | 5238 | .505 | .20 | 42,000 | 82,050 | 8.5 | 9.5 | Granular 70 per cent, dull silky 30 per cent | .07, .10* |
| 6048 | 5244 | .505 | .20 | 38,000 | 76,000 | 10.5 | 13.2 | Granular 60 per cent, dull silky 40 per cent | .11*, .10 |
| 6050 | 5044 | .505 | .20 | 39,000 | 77,050 | 8.5 | 5.7 | Granular, dull spot at circumference | .09*, .08 |
| 6051 | 5254 | .505 | .20 | 39,000 | 78,050 | 7.0 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .08*, .06 |
| 6052 | 5261 | .505 | .20 | 37,000 | 76,000 | 8.0 | 9.5 | Granular 80 per cent, dull silky 20 per cent | .06, .10* |
| 6053 | 5268 | .505 | .20 | 37,000 | 81,000 | 8.5 | 9.5 | Granular | .07, .10* |
| 6054 | 5273 | .505 | .20 | 37,000 | 73,000 | 7.0 | 9.5 | Granular 70 per cent, dull silky 30 per cent | .07*, .07* |
| 6055 | 5280 | .505 | .20 | 36,000 | 73,050 | 8.0 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .08*, .06 |
| 6056 | 5288 | .505 | .20 | 42,000 | 83,050 | 11.0 | 13.2 | .....do | .09, .13* |
| 6057 | 5295 | .505 | .20 | 39,000 | 77,300 | 10.0 | 9.5 | Granular 55 per cent, dull silky 45 per cent | .08, .12* |
| 6058 | 5303 | .505 | .20 | 37,000 | 80,000 | 10.5 | 9.5 | Granular | .11*, .10 |
| 6059 | 5311 | .505 | .20 | 37,000 | 78,950 | 6.5 | 5.7 | .....do | .07*, .06 |
| 6060 | 5318 | .505 | .20 | 34,000 | 76,000 | 7.0 | 9.5 | Granular 80 per cent, dull silky 20 per cent | .08*, .06 |
| 6061 | 5090 | .505 | .20 | 39,000 | 79,450 | 7.0 | 9.5 | Granular, dull silky spot at the circumference | .07*, .07 |

*TABULATION OF TENSION SPECIMENS, ETC.*—Continued.

1000-POUND SHELLS.

| No. of test. | Marks. | Diameter. | Sectional area. | Elastic limit per square inch. | Tensile strength per square inch. | Elongation in 2 inches. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|
| | | *Inch.* | *Sq. in.* | *Pounds.* | *Pounds.* | *Per ct.* | *Per ct.* | | *Inch.* |
| 5979 | 4983 | .505 | .20 | 37,000 | 79,100 | 10.5 | 13.2 | Granular, dull silky spot at the circumference | .10, .11* |
| 5980 | 4942 | .505 | .20 | 43,000 | 74,700 | 6.0 | 9.5 | Granular 40 per cent, dull silky 60 per cent | .05, .07* |
| 5981 | 4950 | .505 | .20 | 40,000 | 76,400 | 8.5 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .08, .09* |
| 5982 | 4957 | .505 | .20 | 38,000 | 78,050 | 5.0 | 5.7 | Granular, varying in size | .04, .06* |
| 5983 | 4964 | .505 | .20 | 39,000 | 77,700 | 4.5 | 5.7 | .....do | .04, .05* |
| 5984 | 4972 | .505 | .20 | 39,000 | 75,500 | 4.0 | 5.7 | .....do | .04, .04* |
| 5989 | 5014 | .505 | .20 | 40,000 | 70,600 | 6.5 | 5.7 | Granular 40 per cent, dull silky 60 per cent | .08*, .05 |
| 5990 | 5020 | .505 | .20 | 38,000 | 72,550 | 8.0 | 9.5 | Granular 50 per cent, dull silky 50 per cent | .09*, .07 |
| 5991 | 5037 | .505 | .20 | 39,000 | 80,100 | 10.5 | 13.2 | Granular, dull silky spot at the circumference | .10, .11* |
| 5992 | 5044 | .505 | .20 | 41,000 | 82,050 | 12.0 | 13.2 | Granular 80 per cent, dull silky 20 per cent | .13*, .11 |
| 5993 | 5050 | .505 | .20 | 39,000 | 79,800 | 12.0 | 13.2 | Granular, silky spot at the circumference | .13*, .11 |
| 5994 | 5057 | .505 | .20 | 43,000 | 80,000 | 8.5 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .09*, .08 |
| 5995 | 5070 | .505 | .20 | 40,000 | 80,000 | 12.0 | 13.2 | Granular, dull silky spot at the circumference | .11, .13* |
| 5996 | 5077 | .505 | .20 | 38,000 | 78,600 | 10.0 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .09, .11* |
| 5997 | 5083 | .505 | .20 | 42,000 | 74,500 | 6.5 | 9.5 | .....do | .08*, .05 |
| 5998 | 5097 | .505 | .20 | 37,000 | 78,900 | 13.5 | 16.9 | .....do | .16*, .11 |
| 5999 | 5104 | .505 | .20 | 33,000 | 76,000 | 10.0 | 9.5 | Granular | .10, .10* |
| 6000 | 5109 | .505 | .20 | 39,000 | 75,600 | 10.5 | 13.2 | Granular 40 per cent, dull silky 60 per cent | .09, .12* |
| 6006 | 5063 | .505 | .20 | 39,000 | 79,600 | 10.0 | 9.5 | Granular 85 per cent, dull silky 15 per cent | .12*, .08 |
| 6007 | 5090 | .505 | .20 | 39,000 | 83,500 | 12.0 | 13.2 | .....do | .11, .13* |
| 6108 | 5110 | .505 | .20 | 42,000 | 82,100 | 10.0 | 9.5 | .....do | .08, .12* |
| 6109 | 5119 | .505 | .20 | 36,000 | 77,600 | 11.0 | 9.5 | Granular 70 per cent, dull silky 30 per cent | .10, .12* |
| 6110 | 5127 | .505 | .20 | 42,000 | 72,700 | 7.0 | 5.7 | Granular 40 per cent, dull silky 60 per cent | .08*, .06 |
| 6011 | 5134 | .505 | .20 | 37,000 | 78,050 | 10.5 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .10, .11* |
| 6012 | 5140 | .505 | .20 | 40,000 | 76,050 | 8.0 | 9.5 | Granular, dull silky at the circumference | .07, .09* |
| 6013 | 5146 | .505 | .20 | 38,000 | 75,100 | 9.5 | 9.5 | Granular 60 per cent, dull silky 40 per cent | .08, .11* |
| 6062 | 5110 | .505 | .20 | 29,000 | 79,600 | 9.0 | 9.5 | Granular, dull spot at the circumference | .07, .11* |

# CAST IRON

FOR

# GUN AND MORTAR CARRIAGES.

## Top Carriage.

### No. 5987.

Marks, T C 103.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00024 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00038 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00045 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00052 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00059 | .00007 | .00006 | .00006 | |
| 11,000 | 11,000 | .00068 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00077 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00088 | .00011 | ..... | ..... | |
| 14,000 | 14,000 | .00097 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00107 | .00010 | ..... | ..... | |
| 16,000 | 16,000 | .00118 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00130 | .00012 | ..... | ..... | |
| 18,000 | 18,000 | .00145 | .00015 | ..... | ..... | |
| 19,000 | 19,000 | .00160 | .00015 | ..... | ..... | |
| 20,000 | 20,000 | .00178 | .00018 | ..... | ..... | |
| 21,000 | 21,000 | .00196 | .00018 | ..... | ..... | |
| 22,000 | 22,000 | .00219 | .00023 | ..... | ..... | |
| 23,000 | 23,000 | .00246 | .00027 | ..... | ..... | |
| 24,000 | 24,000 | .00277 | .00031 | ..... | ..... | |
| 25,000 | 25,000 | .00315 | .00038 | ..... | ..... | |
| 31,160 | 31,160 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ".8 from neck. Appearance, fine granular, gray.

## Top Carriage.

### No. 6049.

Marks, T C 104.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00016 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00029 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00035 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00042 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00058 | .00008 | .00001 | .00001 | |
| 11,000 | 11,000 | .00067 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00073 | .00006 | ..... | ..... | |
| 13,000 | 13,000 | .00082 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00092 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00101 | .00009 | .00009 | .00008 | |
| 16,000 | 16,000 | .00111 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00120 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00130 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00143 | .00013 | ..... | ..... | |
| 20,000 | 20,000 | .00155 | .00012 | .00025 | .00016 | |
| 21,000 | 21,000 | .00172 | .00017 | ..... | ..... | |
| 22,000 | 22,000 | .00188 | .00016 | ..... | ..... | |
| 23,000 | 23,000 | .00207 | .00019 | ..... | ..... | |
| 24,000 | 24,000 | .00226 | .00019 | ..... | ..... | |
| 25,000 | 25,000 | .00252 | .00026 | .00076 | .00051 | |
| 32,220 | 32,220 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 3″.5 from neck. Appearance, granular, light gray, mottled.

No. 6071.

Marks, 109.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00019 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00026 | .00007 | ..... | ..... | |
| 6,000 | 6,000 | .00031 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00039 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00047 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00052 | .00005 | ..... | ..... | |
| 10,000 | 10,000 | .00060 | .00008 | .00002 | .00002 | |
| 11,000 | 11,000 | .00069 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00078 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00086 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00094 | .00008 | .00010 | .00008 | |
| 15,000 | 15,000 | .00104 | .00010 | ..... | ..... | |
| 16,000 | 16,000 | .00113 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00127 | .00014 | ..... | ..... | |
| 18,000 | 18,000 | .00139 | .00012 | ..... | ..... | |
| 19,000 | 19,000 | .00151 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00169 | .00018 | .00031 | .00021 | |
| 21,000 | 21,000 | .00183 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00204 | .00021 | ..... | ..... | |
| 23,000 | 23,000 | .00229 | .00025 | ..... | ..... | |
| 24,000 | 24,000 | .00253 | .00024 | ..... | ..... | |
| 25,000 | 25,000 | .00289 | .00032 | .00104 | .00073 | |
| 31,550 | 31,550 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.1 from neck. Appearance, granular, gray.

## Top Carriage.

### No. 6083.

Marks, T C 111.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00021 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00026 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00032 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00038 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00044 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00059 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00068 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00076 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00083 | .00007 | ..... | ..... | |
| 15,000 | 15,000 | .00091 | .00008 | .00008 | .00007 | |
| 16,000 | 16,000 | .00102 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00111 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00121 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00133 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00145 | .00012 | .00022 | .00014 | |
| 21,000 | 21,000 | .00159 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00178 | .00019 | ..... | ..... | |
| 22,400 | 22,400 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″ from neck. Appearance, granular, gray. A smooth, lustrous spot of metal ″.55 x ″.20 across fractured surface.

## Top Carriage.

### No. 6129.

Marks, T C 117.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00016 | .00009 | ..... | ..... | |
| 4,000 | 4,000 | .00021 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00027 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00032 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00039 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00046 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00004 | ..... | ..... | |
| 10,000 | 10,000 | .00058 | .00008 | .00006 | .00006 | |
| 11,000 | 11,000 | .00066 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00072 | .00006 | ..... | ..... | |
| 13,000 | 13,000 | .00079 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00088 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00097 | .00009 | .00009 | .00008 | |
| 16,000 | 16,000 | .00104 | .00007 | ..... | ..... | |
| 17,000 | 17,000 | .00112 | .00008 | ..... | ..... | |
| 18,000 | 18,000 | .00121 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00130 | .00009 | ..... | ..... | |
| 20,000 | 20,000 | .00140 | .00010 | .00018 | .00009 | |
| 21,000 | 21,000 | .00153 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00166 | .00013 | ..... | ..... | |
| 23,000 | 23,000 | .00178 | .00012 | ..... | ..... | |
| 24,000 | 24,000 | .00193 | .00015 | ..... | ..... | |
| 25,000 | 25,000 | .00206 | .00013 | ..... | ..... | |
| 26,000 | 26,000 | .00224 | .00018 | ..... | ..... | |
| 27,000 | 27,000 | .00250 | .00026 | .00061 | .00043 | |
| 29,980 | 29,980 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, gray.

## Top Carriage.

No. 6140.

Marks, T C 120.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00004 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00020 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00026 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00032 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00047 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00054 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00061 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00078 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00085 | .00007 | ..... | ..... | |
| 15,000 | 15,000 | .00093 | .00008 | .00007 | .00006 | |
| 16,000 | 16,000 | .00102 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00113 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00121 | .00008 | ..... | ..... | |
| 19,000 | 19,000 | .00132 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00143 | .00011 | .00018 | .00011 | |
| 21,000 | 21,000 | .00157 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00171 | .00014 | ..... | ..... | |
| 23,000 | 23,000 | .00189 | .00018 | ..... | ..... | |
| 24,000 | 24,000 | .00200 | .00011 | ..... | ..... | |
| 25,000 | 25,000 | .00220 | .00020 | ..... | ..... | |
| 26,000 | 26,000 | .00248 | .00023 | ..... | ..... | |
| 27,000 | 27,000 | .00271 | .00028 | .00078 | .00060 | |
| 28,750 | 28,750 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.25 from neck. Appearance, fine granular, gray.

## Top Carriage.

### No. 6161.

Marks, T C 123.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00012 | .00006 | | | |
| 4,000 | 4,000 | .00019 | .00007 | | | |
| 5,000 | 5,000 | .00024 | .00005 | | | |
| 6,000 | 6,000 | .00030 | .00006 | | | |
| 7,000 | 7,000 | .00037 | .00007 | | | |
| 8,000 | 8,000 | .00044 | .00007 | | | |
| 9,000 | 9,000 | .00051 | .00007 | | | |
| 10,000 | 10,000 | .00060 | .00009 | 0. | | |
| 11,000 | 11,000 | .00067 | .00007 | | | |
| 12,000 | 12,000 | .00074 | .00007 | | | |
| 13,000 | 13,000 | .00082 | .00008 | | | |
| 14,000 | 14,000 | .00092 | .00010 | | | |
| 15,000 | 15,000 | .00101 | .00009 | .00010 | .00010 | |
| 16,000 | 16,000 | .00111 | .00010 | | | |
| 17,000 | 17,000 | .00121 | .00010 | | | |
| 18,000 | 18,000 | .00132 | .00011 | | | |
| 19,000 | 19,000 | .00143 | .00011 | | | |
| 20,000 | 20,000 | .00155 | .00012 | .00024 | .00014 | |
| 21,000 | 21,000 | .00171 | .00016 | | | |
| 22,000 | 22,000 | .00186 | .00015 | | | |
| 23,000 | 23,000 | .00204 | .00018 | | | |
| 24,000 | 24,000 | .00221 | .00017 | | | |
| 25,000 | 25,000 | .00241 | .00020 | | | |
| 26,000 | 26,000 | .00268 | .00027 | .00080 | .00056 | |
| 30,520 | 30,520 | | | | | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6164.

Marks, T C 124.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00019 | .00008 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00003 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00008 | ..... | ..... | |
| 7,000 | 7,000 | .00037 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00043 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00058 | .00008 | .00003 | .00003 | |
| 11,000 | 11,000 | .00066 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00073 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00082 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00090 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | .00010 | .00010 | .00007 | |
| 16,000 | 16,000 | .00110 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00120 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00131 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00142 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00156 | .00014 | .00027 | .00017 | |
| 21,000 | 21,000 | .00170 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00187 | .00017 | ..... | ..... | |
| 23,000 | 23,000 | .00205 | .00018 | ..... | ..... | |
| 24,000 | 24,000 | .00228 | .00023 | ..... | ..... | |
| 25,000 | 25,000 | .00254 | .00026 | ..... | ..... | |
| 29,550 | 29,550 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″ from neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6165.

Marks, T C 125.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00020 | .00008 | ..... | ..... | |
| 5,000 | 5,000 | .00026 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00032 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00040 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00048 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00054 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00063 | .00009 | .00004 | .00004 | |
| 11,000 | 11,000 | .00071 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00080 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00090 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00100 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00110 | .00010 | .00013 | .00009 | |
| 16,000 | 16,000 | .00123 | .00013 | ..... | ..... | |
| 17,000 | 17,000 | .00133 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00147 | .00014 | ..... | ..... | |
| 19,000 | 19,000 | .00162 | .00015 | ..... | ..... | |
| 20,000 | 20,000 | .00180 | .00018 | .00038 | .00025 | |
| 21,000 | 21,000 | .00199 | .00019 | ..... | ..... | |
| 22,000 | 22,000 | .00220 | .00021 | ..... | ..... | |
| 23,000 | 23,000 | .00248 | .00028 | ..... | ..... | |
| 23,220 | 23,220 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 2″.60 from neck. Appearance, fine granular, light gray. Smooth lump at circumference ″.30 x ″.25.

## Top Carriage.

### No. 6184.

Marks, T C 128.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00007 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00024 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00031 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00037 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00043 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00062 | .00011 | .00002 | .00002 | |
| 11,000 | 11,000 | .00069 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00077 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00084 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00094 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00108 | .00009 | .00008 | .00006 | |
| 16,000 | 16,000 | .00114 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00125 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00136 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00151 | .00015 | ..... | ..... | |
| 20,000 | 20,000 | .00162 | .00011 | .00025 | .00017 | |
| 21,000 | 21,000 | .00180 | .00018 | ..... | ..... | |
| 22,000 | 22,000 | .00198 | .00018 | ..... | ..... | |
| 23,000 | 23,000 | .00213 | .00020 | ..... | ..... | |
| 24,000 | 24,000 | .00233 | .00020 | ..... | ..... | |
| 25,000 | 25,000 | .00253 | .00020 | .00069 | .00044 | |
| 31,280 | 31,280 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6185.

Marks, T C 129.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00023 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00034 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00007 | ..... | ..... | |
| 9,600 | 9,000 | .00048 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00056 | .00008 | .00002 | .00002 | |
| 11,000 | 11,000 | .00062 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00078 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00087 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00096 | .00009 | .00009 | .00007 | |
| 16,000 | 16,000 | .00103 | .00007 | ..... | ..... | |
| 17,000 | 17,000 | .00110 | .00007 | ..... | ..... | |
| 18,000 | 18,000 | .00121 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00134 | .00013 | ..... | ..... | |
| 20,000 | 20,000 | .00146 | .00012 | .00021 | .00012 | |
| 21,000 | 21,000 | .00158 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00170 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00188 | .00018 | ..... | ..... | |
| 24,000 | 24,000 | .00204 | .00016 | ..... | ..... | |
| 25,000 | 25,000 | .00226 | .00022 | ..... | ..... | |
| 26,000 | 26,000 | .00251 | .00025 | .00075 | .00054 | |
| 26,320 | 26,320 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 4″.75 from neck. Appearance, granular, gray. Lump of smooth, lustrous metal ″.20 x ″.30 in the fractured surface.

## Top Carriage.

No. 6188.

Marks, T C 133.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00004 | .00004 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00007 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00046 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00052 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00060 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00067 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00074 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00082 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00091 | .00009 | .00008 | .00007 | |
| 16,000 | 16,000 | .00100 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00109 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00117 | .00008 | ..... | ..... | |
| 19,000 | 19,000 | .00128 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00139 | .00011 | .00021 | .00013 | |
| 21,000 | 21,000 | .00151 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00163 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00180 | .00017 | ..... | ..... | |
| 24,000 | 24,000 | .00194 | .00014 | ..... | ..... | |
| 25,000 | 25,000 | .00215 | .00021 | ..... | ..... | |
| 26,000 | 26,000 | .00232 | .00017 | ..... | ..... | |
| 27,000 | 27,000 | .00260 | .00028 | .00061 | .00060 | |
| 33,800 | 33,800 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.5 from neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6191.

Marks, T C 136.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00009 | .00004 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00019 | .00004 | ..... | ..... | |
| 6,000 | 6,000 | .00026 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00037 | .00004 | ..... | ..... | |
| 9,000 | 9,000 | .00045 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00006 | 0. | ..... | |
| 11,000 | 11,000 | .00058 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00065 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00074 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00078 | .00004 | ..... | ..... | |
| 15,000 | 15,000 | .00087 | .00009 | .00003 | .00003 | |
| 16,000 | 16,000 | .00095 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00105 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00113 | .00008 | ..... | ..... | |
| 19,000 | 19,000 | .00124 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00135 | .00011 | .00015 | .00012 | |
| 21,000 | 21,000 | .00147 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00159 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00173 | .00014 | ..... | ..... | |
| 24,000 | 24,000 | .00188 | .00015 | ..... | ..... | |
| 25,000 | 25,000 | .00206 | .00018 | ..... | ..... | |
| 26,000 | 26,000 | .00226 | .00020 | ..... | ..... | |
| 27,000 | 27,000 | .00251 | .00025 | .00070 | .00055 | |
| 32,610 | 32,610 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.85 from neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6243.

Marks, T C 140.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | | | |
| 3,000 | 3,000 | .00014 | .00007 | | | |
| 4,000 | 4,000 | .00019 | .00005 | | | |
| 5,000 | 5,000 | .00026 | .00007 | | | |
| 6,000 | 6,000 | .00031 | .00005 | | | |
| 7,000 | 7,000 | .00039 | .00008 | | | |
| 8,000 | 8,000 | .00046 | .00007 | | | |
| 9,000 | 9,000 | .00054 | .00008 | | | |
| 10,000 | 10,000 | .00061 | .00007 | .00005 | .00005 | |
| 11,000 | 11,000 | .00069 | .00008 | | | |
| 12,000 | 12,000 | .00078 | .00009 | | | |
| 13,000 | 13,000 | .00088 | .00010 | | | |
| 14,000 | 14,000 | .00099 | .00011 | | | |
| 15,000 | 15,000 | .00110 | .00011 | .00018 | .00013 | |
| 16,000 | 16,000 | .00126 | .00016 | | | |
| 17,000 | 17,000 | .00139 | .00013 | | | |
| 18,000 | 18,000 | .00154 | .00015 | | | |
| 19,000 | 19,000 | .00174 | .00020 | | | |
| 20,000 | 20,000 | .00198 | .00024 | .00060 | .00042 | |
| 21,000 | 21,000 | .00224 | .00026 | | | |
| 22,000 | 22,000 | .00264 | .00040 | | | |
| 23,000 | 23,000 | .00300 | .00036 | | | |
| 24,000 | 24,000 | .00350 | .00050 | | | |
| 25,000 | 25,000 | .00422 | .00072 | .00239 | .00179 | |
| 27,120 | 27,120 | | | | | Tensile strength. |

Fractured 1″.4 from neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6250.

Marks, T C 147.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00012 | .00006 | | | |
| 4,000 | 4,000 | .00018 | .00006 | | | |
| 5,000 | 5,000 | .00023 | .00005 | | | |
| 6,000 | 6,000 | .00029 | .00006 | | | |
| 7,000 | 7,000 | .00034 | .00005 | | | |
| 8,000 | 8,000 | .00041 | .00007 | | | |
| 9,000 | 9,000 | .00049 | .00008 | | | |
| 10,000 | 10,000 | .00057 | .00008 | .00004 | .00004 | |
| 11,000 | 11,000 | .00064 | .00007 | | | |
| 12,000 | 12,000 | .00070 | .00006 | | | |
| 13,000 | 13,000 | .00079 | .00009 | | | |
| 14,000 | 14,000 | .00088 | .00009 | | | |
| 15,000 | 15,000 | .00098 | .00010 | .00008 | .00004 | |
| 16,000 | 16,000 | .00108 | .00010 | | | |
| 17,000 | 17,000 | .00118 | .00010 | | | |
| 18,000 | 18,000 | .00128 | .00010 | | | |
| 19,000 | 19,000 | .00139 | .00011 | | | |
| 20,000 | 20,000 | .00154 | .00015 | .00027 | .00019 | |
| 21,000 | 21,000 | .00169 | .00015 | | | |
| 22,000 | 22,000 | .00185 | .00016 | | | |
| 23,000 | 23,000 | .00204 | .00019 | | | |
| 24,000 | 24,000 | .00223 | .00019 | | | |
| 25,000 | 25,000 | .00248 | .00025 | | | |
| 26,000 | 26,000 | .00275 | .00027 | .00092 | .00065 | |
| 31,110 | 31,110 | | | | | Tensile strength. |

Fractured ″.5 from neck. Appearance, fine granular, light gray.

## Top Carriage.

### No. 6328.

Marks, T C 163.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00021 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00027 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00032 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00047 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00054 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00062 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00071 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00080 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00089 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00099 | .00010 | .00008 | .00007 | |
| 16,000 | 16,000 | .00109 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00120 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00131 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00142 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00158 | .00016 | .00022 | .00014 | |
| 21,000 | 21,000 | .00171 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00189 | .00018 | ..... | ..... | |
| 23,000 | 23,000 | .00207 | .00018 | ..... | ..... | |
| 24,000 | 24,000 | .00230 | .00023 | ..... | ..... | |
| 25,000 | 25,000 | .00251 | .00021 | .00075 | .00053 | |
| 30,470 | 30,470 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″ from neck. Appearance fine granular, light gray.

## Top Carriage.

### No. 6440.

Marks, T C 171.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00021 | .00009 | ..... | ..... | |
| 5,000 | 5,000 | .00030 | .00009 | ..... | ..... | |
| 6,000 | 6,000 | .00039 | .00009 | ..... | ..... | |
| 7,000 | 7,000 | .00049 | .00010 | ..... | ..... | |
| 8,000 | 8,000 | .00059 | .00010 | ..... | ..... | |
| 9,000 | 9,000 | .00069 | .00010 | ..... | ..... | |
| 10,000 | 10,000 | .00080 | .00011 | .00008 | .00008 | |
| 11,000 | 11,000 | .00094 | .00014 | ..... | ..... | |
| 12,000 | 12,000 | .00107 | .00013 | ..... | ..... | |
| 13,000 | 13,000 | .00120 | .00013 | ..... | ..... | |
| 14,000 | 14,000 | .00138 | .00018 | ..... | ..... | |
| 15,000 | 15,000 | .00157 | .00019 | .00029 | .00021 | |
| 16,000 | 16,000 | .00179 | .00022 | ..... | ..... | |
| 17,000 | 17,000 | .00209 | .00030 | ..... | ..... | |
| 18,000 | 18,000 | .00239 | .00030 | ..... | ..... | |
| 18,300 | 18,300 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance fine granular, dark gray.

## Chassis Rail.

### No. 6187.

Marks, C R 132.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00009 | .00003 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00023 | .00008 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00046 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00005 | .00002 | .00002 | |
| 11,000 | 11,000 | .00058 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00065 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00071 | .00006 | ..... | ..... | |
| 14,000 | 14,000 | .00078 | .00007 | ..... | ..... | |
| 15,000 | 15,000 | .00086 | .00008 | .00007 | .00005 | |
| 16,000 | 16,000 | .00093 | .00007 | ..... | ..... | |
| 17,000 | 17,000 | .00101 | .00008 | ..... | ..... | |
| 18,000 | 18,000 | .00110 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00119 | .00009 | ..... | ..... | |
| 20,000 | 20,000 | .00128 | .00009 | .00014 | .00007 | |
| 21,000 | 21,000 | .00138 | .00010 | ..... | ..... | |
| 22,000 | 22,000 | .00149 | .00011 | ..... | ..... | |
| 23,000 | 23,000 | .00160 | .00011 | ..... | ..... | |
| 24,000 | 24,000 | .00170 | .00010 | ..... | ..... | |
| 25,000 | 25,000 | .00182 | .00012 | ..... | ..... | |
| 26,000 | 26,000 | .00200 | .00018 | ..... | ..... | |
| 27,000 | 27,000 | .00218 | .00018 | ..... | ..... | |
| 28,000 | 28,000 | .00233 | .00015 | ..... | ..... | |
| 29,000 | 29,000 | .00252 | .00019 | .00072 | .00058 | |
| 34,760 | 34,760 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.2 from neck. Appearance fine, granular, light gray, mottled.

## Base Ring.

No. 6084.

Marks, B R 112.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00007 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00023 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00036 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00005 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00009 | ..... | ..... | |
| 10,000 | 10,000 | .00057 | .00007 | .00002 | .00002 | |
| 11,000 | 11,000 | .00063 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00071 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00079 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00087 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00096 | .00009 | .00008 | .00006 | |
| 16,000 | 16,000 | .00103 | .00007 | ..... | ..... | |
| 17,000 | 17,000 | .00112 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00122 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00134 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00145 | .00011 | .00019 | .00011 | |
| 21,000 | 21,000 | .00158 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00172 | .00014 | ..... | ..... | |
| 23,000 | 23,000 | .00183 | .00011 | ..... | ..... | |
| 24,000 | 24,000 | .00200 | .00017 | ..... | ..... | |
| 25,000 | 25,000 | .00220 | .00020 | ..... | ..... | |
| 26,000 | 26,000 | .00236 | .00016 | ..... | ..... | |
| 27,000 | 27,000 | .00258 | .00022 | .00071 | .00062 | |
| 32,280 | 32,280 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, gray.

## Base Ring.

### No. 6107.

Marks, B R 114.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00019 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00032 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00038 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00043 | .00005 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00060 | .00009 | .00001 | .00001 | |
| 11,000 | 11,000 | .00066 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00073 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00080 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00090 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | .00010 | .00008 | .00007 | |
| 16,000 | 16,000 | .00108 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00118 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00128 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00140 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00152 | .00012 | .00021 | .00013 | |
| 21,000 | 21,000 | .00166 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00181 | .00015 | ..... | ..... | |
| 23,000 | 23,000 | .00201 | .00020 | ..... | ..... | |
| 24,000 | 24,000 | .00219 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00241 | .00022 | ..... | ..... | |
| 26,000 | 26,000 | .00263 | .00022 | .00077 | .00056 | |
| 31,900 | 31,900 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.9 from neck. Appearance, fine granular, gray.

## Base Ring.

### No. 6128.

Marks, B R 116.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00019 | .00008 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00003 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00008 | ..... | ..... | |
| 7,000 | 7,000 | .00036 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00043 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00059 | .00009 | .00002 | .00002 | |
| 11,000 | 11,000 | .00067 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00077 | .00010 | ..... | ..... | |
| 13,000 | 13,000 | .00086 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00094 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00104 | .00010 | .00012 | .00010 | |
| 16,000 | 16,000 | .00114 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00129 | .00015 | ..... | ..... | |
| 18,000 | 18,000 | .00140 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00152 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00171 | .00019 | .00032 | .00020 | |
| 21,000 | 21,000 | .00188 | .00017 | ..... | ..... | |
| 22,000 | 22,000 | .00211 | .00023 | ..... | ..... | |
| 23,000 | 23,000 | .00238 | .00027 | ..... | ..... | |
| 24,000 | 24,000 | .00270 | .00032 | ..... | ..... | |
| 25,000 | 25,000 | .00304 | .00034 | .00113 | .00081 | |
| 25,800 | 25,800 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.7 from neck. Appearance, fine granular, light gray.

## Base Ring.

## No. 6139.

Marks, B R 119.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00007 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00037 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00044 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00058 | .00008 | .00001 | .00001 | |
| 11,000 | 11,000 | .00067 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00075 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00082 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00091 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | .00009 | .00008 | .00007 | |
| 16,000 | 16,000 | .00110 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00120 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00131 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00143 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00154 | .00011 | .00020 | .00012 | |
| 21,000 | 21,000 | .00168 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00180 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00199 | .00019 | ..... | ..... | |
| 24,000 | 24,000 | .00217 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00238 | .00021 | ..... | ..... | |
| 26,000 | 26,000 | .00261 | .00023 | .00067 | .00047 | |
| 28,900 | 28,900 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.75 from neck. Appearance, fine granular, light gray.

## Base Ring.

No. 6152.

Marks, B R 122.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00024 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00029 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00035 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00048 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00056 | .00008 | .00001 | .00001 | |
| 11,000 | 11,000 | .00062 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00079 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00088 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00097 | .00009 | .00008 | .00007 | |
| 16,000 | 16,000 | .00105 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00116 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00125 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00136 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00149 | .00013 | .00020 | .00012 | |
| 21,000 | 21,000 | .00162 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00177 | .00015 | ..... | ..... | |
| 23,000 | 23,000 | .00192 | .00015 | ..... | ..... | |
| 24,000 | 24,000 | .00210 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00230 | .00020 | ..... | ..... | |
| 26,000 | 26,000 | .00252 | .00022 | .00069 | .00049 | |
| 29,210 | 29,210 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″ from neck. Appearance, fine granular, light gray, 80 per cent; dark gray on one side, 20 per cent.

## Base Ring.

### No. 6167.

Marks, B R 127.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00004 | .00004 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00016 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00021 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00048 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00053 | .00005 | .00002 | .00002 | |
| 11,000 | 11,000 | .00063 | .00010 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00076 | .00006 | ..... | ..... | |
| 14,000 | 14,000 | .00084 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00093 | .00009 | .00008 | .00006 | |
| 16,000 | 16,000 | .00104 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00113 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00123 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00134 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00148 | .00014 | .00022 | .00014 | |
| 21,000 | 21,000 | .00160 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00175 | .00015 | ..... | ..... | |
| 23,000 | 23,000 | .00190 | .00015 | ..... | ..... | |
| 24,000 | 24,000 | .00210 | .00020 | ..... | ..... | |
| 25,000 | 25,000 | .00230 | .00020 | ..... | ..... | |
| 26,000 | 26,000 | .00258 | .00023 | .00073 | .00051 | |
| 31,690 | 31,690 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.60 from neck. Appearance, fine granular, light gray.

## Base Ring.

### No. 6186.

Marks, B R 131.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00004 | .00004 | | | |
| 3,000 | 3,000 | .00011 | .00007 | | | |
| 4,000 | 4,000 | .00017 | .00006 | | | |
| 5,000 | 5,000 | .00022 | .00005 | | | |
| 6,000 | 6,000 | .00029 | .00007 | | | |
| 7,000 | 7,000 | .00033 | .00004 | | | |
| 8,000 | 8,000 | .00040 | .00007 | | | |
| 9,000 | 9,000 | .00046 | .00006 | | | |
| 10,000 | 10,000 | .00053 | .00007 | .00002 | .00002 | |
| 11,000 | 11,000 | .00061 | .00008 | | | |
| 12,000 | 12,000 | .00068 | .00007 | | | |
| 13,000 | 13,000 | .00075 | .00007 | | | |
| 14,000 | 14,000 | .00082 | .00007 | | | |
| 15,000 | 15,000 | .00091 | .00009 | .00010 | .00008 | |
| 16,000 | 16,000 | .00101 | .00010 | | | |
| 17,000 | 17,000 | .00111 | .00010 | | | |
| 18,000 | 18,000 | .00121 | .00010 | | | |
| 19,000 | 19,000 | .00131 | .00010 | | | |
| 20,000 | 20,000 | .00142 | .00011 | .00024 | .00014 | |
| 21,000 | 21,000 | .00155 | .00013 | | | |
| 22,000 | 22,000 | .00170 | .00015 | | | |
| 23,000 | 23,000 | .00183 | .00013 | | | |
| 24,000 | 24,000 | .00202 | .00019 | | | |
| 25,000 | 25,000 | .00222 | .00020 | | | |
| 26,000 | 26,000 | .00243 | .00021 | | | |
| 27,000 | 27,000 | .00267 | .00024 | .00091 | .00067 | |
| 34,020 | 34,020 | | | | | Tensile strength. |

Fractured 1″.5 from neck. Appearance, fine granular, light gray.

## Base Ring.

### No. 6217.

Marks, B R 139.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00019 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00031 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00040 | .00009 | ..... | ..... | |
| 8,000 | 8,000 | .00048 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00055 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00062 | .00007 | .00006 | .00006 | |
| 11,000 | 11,000 | .00071 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00081 | .00010 | ..... | ..... | |
| 13,000 | 13,000 | .00091 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00102 | .00011 | ..... | ..... | |
| 15,000 | 15,000 | .00115 | .00013 | .00021 | .00016 | |
| 16,000 | 16,000 | .00129 | .00014 | ..... | ..... | |
| 17,000 | 17,000 | .00146 | .00017 | ..... | ..... | |
| 18,000 | 18,000 | .00163 | .00017 | ..... | ..... | |
| 19,000 | 19,000 | .00190 | .00027 | ..... | ..... | |
| 20,000 | 20,000 | .00218 | .00028 | .00077 | .00056 | |
| 21,000 | 21,000 | .00259 | .00041 | ..... | ..... | |
| 22,000 | 22,000 | .00293 | .00034 | ..... | ..... | |
| 23,000 | 23,000 | .00350 | .00057 | .00185 | .00108 | |
| 27,290 | 27,290 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.3 from neck. Appearance, granular, dark gray.

## Base Ring.

### No. 6248.

Marks, B R 145.
Diameter, 1″.129.
Sectional area, 1.00 square inch
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00034 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00048 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00054 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00062 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00071 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00079 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00088 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00097 | .00009 | .00009 | .00008 | |
| 16,000 | 16,000 | .00106 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00116 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00127 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00139 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00152 | .00013 | .00024 | .00015 | |
| 21,000 | 21,000 | .00168 | .00016 | ..... | ..... | |
| 22,000 | 22,000 | .00182 | .00014 | ..... | ..... | |
| 23,000 | 23,000 | .00201 | .00019 | ..... | ..... | |
| 24,000 | 24,000 | .00221 | .00020 | ..... | ..... | |
| 25,000 | 25,000 | .00243 | .00022 | ..... | ..... | |
| 26,000 | 26,000 | .00270 | .00027 | .00088 | .00064 | |
| 31,040 | 31,040 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.5 from neck. Appearance, fine granular, light gray.

## Base Ring.

### No. 6267.

Marks, B R 150.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00024 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00038 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00043 | .00005 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00059 | .00008 | .00001 | .00001 | |
| 11,000 | 11,000 | .00067 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00075 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00083 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00091 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | .00009 | .00010 | .00009 | |
| 16,000 | 16,000 | .00110 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00121 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00131 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00146 | .00015 | ..... | ..... | |
| 20,000 | 20,000 | .00159 | .00013 | .00027 | .00017 | |
| 21,000 | 21,000 | .00172 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00189 | .00017 | ..... | ..... | |
| 23,000 | 23,000 | .00206 | .00017 | ..... | ..... | |
| 24,000 | 24,000 | .00228 | .00022 | ..... | ..... | |
| 25,000 | 25,000 | .00250 | .00022 | .00072 | .00045 | |
| 30,020 | 30,020 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1".45 from neck. Appearance, fine granular, light gray, mottled.

## Base Ring.

No. 6286.

Marks, B R 154.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00004 | .00004 | | | |
| 3,000 | 3,000 | .00010 | .00006 | | | |
| 4,000 | 4,000 | .00015 | .00005 | | | |
| 5,000 | 5,000 | .00020 | .00005 | | | |
| 6,000 | 6,000 | .00026 | .00006 | | | |
| 7,000 | 7,000 | .00031 | .00005 | | | |
| 8,000 | 8,000 | .00038 | .00007 | | | |
| 9,000 | 9,000 | .00044 | .00006 | | | |
| 10,000 | 10,000 | .00051 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00058 | .00007 | | | |
| 12,000 | 12,000 | .00065 | .00007 | | | |
| 13,000 | 13,000 | .00071 | .00006 | | | |
| 14,000 | 14,000 | .00080 | .00009 | | | |
| 15,000 | 15,000 | .00088 | .00008 | .00007 | .00006 | |
| 16,000 | 16,000 | .00097 | .00009 | | | |
| 17,000 | 17,000 | .00105 | .00008 | | | |
| 18,000 | 18,000 | .00114 | .00009 | | | |
| 19,000 | 19,000 | .00124 | .00010 | | | |
| 20,000 | 20,000 | .00133 | .00009 | .00018 | .00011 | |
| 21,000 | 21,000 | .00145 | .00012 | | | |
| 22,000 | 22,000 | .00158 | .00013 | | | |
| 23,000 | 23,000 | .00171 | .00013 | | | |
| 24,000 | 24,000 | .00187 | .00016 | | | |
| 25,000 | 25,000 | .00202 | .00015 | | | |
| 26,000 | 26,000 | .00222 | .00020 | | | |
| 27,000 | 27,000 | .00241 | .00019 | | | |
| 28,000 | 28,000 | .00271 | .00030 | .00084 | .00066 | |
| 28,900 | 28,900 | | | | | Tensile strength. |

Fractured 2".5 from neck. Appearance, fine granular, light gray. Smooth lustrous spot ".10 by ".35 in fractured surface.

## Base Ring.

### No. 6303.

Marks, B R 157.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00029 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00035 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00049 | .00008 | ..... | ..... | |
| 10,000 | 10,000 | .00056 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00063 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00079 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00087 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00096 | .00009 | .00008 | .00007 | |
| 16,000 | 16,000 | .00105 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00116 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00127 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00140 | .00013 | ..... | ..... | |
| 20,000 | 20,000 | .00152 | .00012 | .00023 | .00015 | |
| 21,000 | 21,000 | .00170 | .00018 | ..... | ..... | |
| 22,000 | 22,000 | .00187 | .00017 | ..... | ..... | |
| 23,000 | 23,000 | .00207 | .00020 | ..... | ..... | |
| 24,000 | 24,000 | .00225 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00250 | .00025 | .00075 | .00052 | |
| 30,980 | 30,980 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, gray.

## Base Ring.

No. 6326.

Marks, B R 161.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | | | |
| 3,000 | 3,000 | .00010 | .00005 | | | |
| 4,000 | 4,000 | .00015 | .00005 | | | |
| 5,000 | 5,000 | .00020 | .00005 | | | |
| 6,000 | 6,000 | .00026 | .00006 | | | |
| 7,000 | 7,000 | .00031 | .00005 | | | |
| 8,000 | 8,000 | .00036 | .00005 | | | |
| 9,000 | 9,000 | .00042 | .00006 | | | |
| 10,000 | 10,000 | .00050 | .00008 | 0. | | |
| 11,000 | 11,000 | .00056 | .00006 | | | |
| 12,000 | 12,000 | .00063 | .00007 | | | |
| 13,000 | 13,000 | .00071 | .00008 | | | |
| 14,000 | 14,000 | .00079 | .00008 | | | |
| 15,000 | 15,000 | .00088 | .00009 | .00005 | .00005 | |
| 16,000 | 16,000 | .00097 | .00009 | | | |
| 17,000 | 17,000 | .00106 | .00009 | | | |
| 18,000 | 18,000 | .00116 | .00010 | | | |
| 19,000 | 19,000 | .00125 | .00009 | | | |
| 20,000 | 20,000 | .00137 | .00012 | .00018 | .00013 | |
| 21,000 | 21,000 | .00149 | .00012 | | | |
| 22,000 | 22,000 | .00162 | .00013 | | | |
| 23,000 | 23,000 | .00174 | .00012 | | | |
| 24,000 | 24,000 | .00190 | .00016 | | | |
| 25,000 | 25,000 | .00210 | .00020 | | | |
| 26,000 | 26,000 | .00230 | .00020 | | | |
| 27,000 | 27,000 | .00252 | .00022 | .00076 | .00058 | |
| 33,560 | 33,560 | | | | | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray, mottled.

## Base Ring.

### No. 6329.

Marks, B R 164.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00011 | .00005 | | | |
| 4,000 | 4,000 | .00017 | .00006 | | | |
| 5,000 | 5,000 | .00022 | .00005 | | | |
| 6,000 | 6,000 | .00030 | .00008 | | | |
| 7,000 | 7,000 | .00037 | .00007 | | | |
| 8,000 | 8,000 | .00043 | .00006 | | | |
| 9,000 | 9,000 | .00050 | .00007 | | | |
| 10,000 | 10,000 | .00059 | .00009 | .00002 | .00002 | |
| 11,000 | 11,000 | .00066 | .00007 | | | |
| 12,000 | 12,000 | .00074 | .00008 | | | |
| 13,000 | 13,000 | .00082 | .00008 | | | |
| 14,000 | 14,000 | .00091 | .00009 | | | |
| 15,000 | 15,000 | .00100 | .00009 | .00009 | .00007 | |
| 16,000 | 16,000 | .00110 | .00010 | | | |
| 17,000 | 17,000 | .00121 | .00011 | | | |
| 18,000 | 18,000 | .00131 | .00010 | | | |
| 19,000 | 19,000 | .00142 | .00011 | | | |
| 20,000 | 20,000 | .00155 | .00013 | .00022 | .00013 | |
| 21,000 | 21,000 | .00169 | .00014 | | | |
| 22,000 | 22,000 | .00182 | .00013 | | | |
| 23,000 | 23,000 | .00200 | .00018 | | | |
| 24,000 | 24,000 | .00218 | .00018 | | | |
| 25,000 | 25,000 | .00238 | .00020 | | | |
| 26,000 | 26,000 | .00259 | .00021 | .00071 | .00049 | |
| 33,700 | 33,700 | | | | | Tensile strength. |

Fractured 2″.1 from neck. Appearance, fine granular, light gray, darker section on one side.

## Base Ring.

### No. 6332.

Marks, B R 167.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00007 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00037 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00045 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00059 | .00008 | .00006 | .00006 | |
| 11,000 | 11,000 | .00066 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00074 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00082 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00092 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00108 | .00011 | .00018 | .00012 | |
| 16,000 | 16,000 | .00114 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00129 | .00015 | ..... | ..... | |
| 18,000 | 18,000 | .00142 | .00013 | ..... | ..... | |
| 19,000 | 19,000 | .00161 | .00019 | ..... | ..... | |
| 20,000 | 20,000 | .00182 | .00021 | .00059 | .00041 | |
| 21,000 | 21,000 | .00210 | .00028 | ..... | ..... | |
| 22,000 | 22,000 | .00250 | .00040 | ..... | ..... | |
| 22,300 | 22,300 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 3″.1 from neck. Appearance, fine granular, light gray, 60 per cent; smooth lustrous spot ″.30 x ″.40, surrounded by dark gray metal, 40 per cent.

## Base Ring.

### No. 6372.

Marks, B R. 170.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00009 | .00004 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00020 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00027 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00032 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00038 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00045 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00060 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00069 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00078 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00087 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00094 | .00007 | .00009 | .00008 | |
| 16,000 | 16,000 | .00104 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00114 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00125 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00136 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00149 | .00013 | .00022 | .00013 | |
| 21,000 | 21,000 | .00161 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00178 | .00017 | ..... | ..... | |
| 23,000 | 23,000 | .00200 | .00022 | ..... | ..... | |
| 24,000 | 24,000 | .00220 | .00020 | ..... | ..... | |
| 25,000 | 25,000 | .00240 | .00020 | ..... | ..... | |
| 26,000 | 26,000 | .00268 | .00028 | .00088 | .00066 | |
| 30,880 | 30,880 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, gray.

## Base Ring.

### No. 6441.

Marks, B R 172.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | | | |
| 3,000 | 3,000 | .00014 | .00007 | | | |
| 4,000 | 4,000 | .00020 | .00006 | | | |
| 5,000 | 5,000 | .00028 | .00008 | | | |
| 6,000 | 6,000 | .00033 | .00005 | | | |
| 7,000 | 7,000 | .00040 | .00007 | | | |
| 8,000 | 8,000 | .00049 | .00009 | | | |
| 9,000 | 9,000 | .00057 | .00008 | | | |
| 10,000 | 10,000 | .00065 | .00008 | .00007 | .00007 | |
| 11,000 | 11,000 | .00072 | .00007 | | | |
| 12,000 | 12,000 | .00080 | .00008 | | | |
| 13,000 | 13,000 | .00090 | .00010 | | | |
| 14,000 | 14,000 | .00100 | .00010 | | | |
| 15,000 | 15,000 | .00110 | .00010 | .00014 | .00007 | |
| 16,000 | 16,000 | .00122 | .00012 | | | |
| 17,000 | 17,000 | .00133 | .00011 | | | |
| 18,000 | 18,000 | .00148 | .00015 | | | |
| 19,000 | 19,000 | .00161 | .00013 | | | |
| 20,000 | 20,000 | .00179 | .00018 | .00040 | .00026 | |
| 21,000 | 21,000 | .00199 | .00020 | | | |
| 22,000 | 22,000 | .00221 | .00022 | | | |
| 23,000 | 23,000 | .00245 | .00024 | | | |
| 24,000 | 24,000 | .00272 | .00027 | | | |
| 25,000 | 25,000 | .00316 | .00044 | .00123 | .00083 | |
| 30,080 | 30,080 | | | | | Tensile strength. |

Fractured at the neck. Appearance, fine granular, dark gray.

## RACER.

### No. 6106.

Marks, R 113.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00020 | .00008 | ..... | ..... | |
| 5,000 | 5,000 | .00026 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00032 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00040 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00048 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00055 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00062 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00070 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00079 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00088 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00098 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00107 | .00009 | .00006 | .00007 | |
| 16,000 | 16,000 | .00115 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00125 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00136 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00149 | .00013 | ..... | ..... | |
| 20,000 | 20,000 | .00161 | .00012 | .00023 | .00015 | |
| 21,000 | 21,000 | .00175 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00191 | .00016 | ..... | ..... | |
| 23,000 | 23,000 | .00212 | .00021 | ..... | ..... | |
| 24,000 | 24,000 | .00230 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00251 | .00021 | .00068 | .00045 | |
| 31,610 | 31,610 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.2 from neck. Appearance, fine granular, gray.

## RACER.

No. 6108.

Marks, R 115.
Diameter, 1″.129.
Sectional area, 1.00 square inch
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00011 | .00005 | | | |
| 4,000 | 4,000 | .00017 | .00006 | | | |
| 5,000 | 5,000 | .00022 | .00005 | | | |
| 6,000 | 6,000 | .00029 | .00007 | | | |
| 7,000 | 7,000 | .00035 | .00006 | | | |
| 8,000 | 8,000 | .00041 | .00006 | | | |
| 9,000 | 9,000 | .00047 | .00006 | | | |
| 10,000 | 10,000 | .00052 | .00005 | .00001 | .00001 | |
| 11,000 | 11,000 | .00060 | .00008 | | | |
| 12,000 | 12,000 | .00068 | .00008 | | | |
| 13,000 | 13,000 | .00074 | .00006 | | | |
| 14,000 | 14,000 | .00081 | .00007 | | | |
| 15,000 | 15,000 | .00090 | .00009 | .00007 | .00006 | |
| 16,000 | 16,000 | .00099 | .00009 | | | |
| 17,000 | 17,000 | .00107 | .00008 | | | |
| 18,000 | 18,000 | .00114 | .00007 | | | |
| 19,000 | 19,000 | .00123 | .00009 | | | |
| 20,000 | 20,000 | .00132 | .00009 | .00011 | .00004 | |
| 21,000 | 21,000 | .00144 | .00012 | | | |
| 22,000 | 22,000 | .00156 | .00012 | | | |
| 23,000 | 23,000 | .00168 | .00012 | | | |
| 24,000 | 24,000 | .00180 | .00012 | | | |
| 25,000 | 25,000 | .00195 | .00015 | | | |
| 26,000 | 26,000 | .00210 | .00015 | | | |
| 27,000 | 27,000 | .00230 | .00020 | | | |
| 28,000 | 28,000 | .00250 | .00020 | .00061 | .00050 | |
| 33,020 | 33,020 | | | | | Tensile strength. |

Fractured at the neck. Appearance fine granular, gray.

## RACER.

### No. 6130.

Marks, R 118.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00004 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00008 | ..... | ..... | |
| 6,000 | 6,000 | .00032 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00037 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00045 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00006 | ..... | ..... | |
| 10,000 | 10,000 | .00059 | .00008 | .00005 | .00005 | |
| 11,000 | 11,000 | .00068 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00077 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00087 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00096 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00106 | .00010 | .00009 | .00004 | |
| 16,000 | 16,000 | .00116 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00127 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00138 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00155 | .00017 | ..... | ..... | |
| 20,000 | 20,000 | .00168 | .00013 | .00027 | .00018 | |
| 21,000 | 21,000 | .00184 | .00016 | ..... | ..... | |
| 22,000 | 22,000 | .00201 | .00017 | ..... | ..... | |
| 23,000 | 23,000 | .00226 | .00024 | ..... | ..... | |
| 24,000 | 24,000 | .00247 | .00022 | ..... | ..... | |
| 25,000 | 25,000 | .00277 | .00030 | .00079 | .00052 | |
| 27,020 | 27,020 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 2".6 from neck. Appearance fine granular, gray.

## RACER.

### No. 6150.

Marks, R 121.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00008 | ..... | ..... | |
| 7,000 | 7,000 | .00037 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00042 | .00005 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00009 | ..... | ..... | |
| 10,000 | 10,000 | .00058 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00065 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00072 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00082 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00091 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | .00009 | .00008 | .00007 | |
| 16,000 | 16,000 | .00111 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00121 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00131 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00143 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00156 | .00013 | .00021 | .00013 | |
| 21,000 | 21,000 | .00172 | .00016 | ..... | ..... | |
| 22,000 | 22,000 | .00188 | .00016 | ..... | ..... | |
| 23,000 | 23,000 | .00206 | .00018 | ..... | ..... | |
| 24,000 | 24,000 | .00222 | .00016 | ..... | ..... | |
| 25,000 | 25,000 | .00250 | .00028 | .00064 | .00043 | |
| 27,420 | 27,420 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance fine granular, light gray.

## RACER.

### No. 6166.

Marks, R 126.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00019 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00031 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00039 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00045 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00052 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00060 | .00008 | .00004 | .00004 | |
| 11,000 | 11,000 | .00067 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00074 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00082 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00090 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | 00010 | .00010 | .00006 | |
| 16,000 | 16,000 | .00111 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00119 | .00008 | ..... | ..... | |
| 18,000 | 18,000 | .00129 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00139 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00150 | .00011 | .00023 | .00013 | |
| 21,000 | 21,000 | .00163 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00178 | .00015 | ..... | ..... | |
| 23,000 | 23,000 | .00192 | .00014 | ..... | ..... | |
| 24,000 | 24,000 | .00210 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00229 | .00019 | ..... | ..... | |
| 26,000 | 26,000 | .00250 | .00021 | .00069 | .00046 | |
| 31,980 | 31,980 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.50 from neck. Appearance, fine granular, light gray.

## RACER.

No. 6190.

Marks, R 134.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | | | |
| 3,000 | 3,000 | .00010 | .00005 | | | |
| 4,000 | 4,000 | .00015 | .00005 | | | |
| 5,000 | 5,000 | .00021 | .00006 | | | |
| 6,000 | 6,000 | .00026 | .00005 | | | |
| 7,000 | 7,000 | .00031 | .00005 | | | |
| 8,000 | 8,000 | .00037 | .00006 | | | |
| 9,000 | 9,000 | .00043 | .00006 | | | |
| 10,000 | 10,000 | .00050 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00056 | .00006 | | | |
| 12,000 | 12,000 | .00062 | .00006 | | | |
| 13,000 | 13,000 | .00070 | .00008 | | | |
| 14,000 | 14,000 | .00077 | .00007 | | | |
| 15,000 | 15,000 | .00083 | .00006 | .00003 | .00002 | |
| 16,000 | 16,000 | .00090 | .00007 | | | |
| 17,000 | 17,000 | .00099 | .00009 | | | |
| 18,000 | 18,000 | .00106 | .00007 | | | |
| 19,000 | 19,000 | .00113 | .00007 | | | |
| 20,000 | 20,000 | .00121 | .00008 | .00011 | .00008 | |
| 21,000 | 21,000 | .00132 | .00011 | | | |
| 22,000 | 22,000 | .00141 | .00009 | | | |
| 23,000 | 23,000 | .00151 | .00010 | | | |
| 24,000 | 24,000 | .00162 | .00011 | | | |
| 25,000 | 25,000 | .00176 | .00014 | | | |
| 26,000 | 26,000 | .00189 | .00013 | | | |
| 27,000 | 27,000 | .00202 | .00013 | | | |
| 28,000 | 28,000 | .00220 | .00018 | | | |
| 29,000 | 29,000 | .00239 | .00019 | | | |
| 30,000 | 30,000 | .00260 | .00021 | .00071 | .00060 | |
| 35,280 | 35,280 | | | | | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray.

## RACER.

### No. 6216.

Marks, R 138.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00004 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00021 | .00004 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00034 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00047 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00053 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00060 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00068 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00073 | .00005 | ..... | ..... | |
| 14,000 | 14,000 | .00081 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00090 | .00009 | .00008 | .00007 | |
| 16,000 | 16,000 | .00098 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00108 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00117 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00127 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00136 | .00009 | .00018 | .00010 | |
| 21,000 | 21,000 | .00149 | .00013 | ..... | ..... | |
| 22,000 | 22,000 | .00160 | .00011 | ..... | ..... | |
| 23,000 | 23,000 | .00172 | .00012 | ..... | ..... | |
| 24,000 | 24,000 | .00189 | .00017 | ..... | ..... | |
| 25,000 | 25,000 | .00204 | .00015 | ..... | ..... | |
| 26,000 | 26,000 | .00221 | .00017 | ..... | ..... | |
| 27,000 | 27,000 | .00248 | .00027 | ..... | ..... | |
| 28,000 | 28,000 | .00270 | .00022 | .00082 | .00064 | |
| 35,340 | 35,340 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 2″.2 from neck. Appearance, fine granular, light gray.

## RACER.

### No. 6244.

**Marks R 141.**
**Diameter, 1".129.**
**Sectional area, 1.00 square inch.**
**Length of stem, 10".**
**Gauged length, 10".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00023 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00029 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00035 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00048 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00055 | .00007 | 0. | ..... | |
| 11,000 | 11,000 | .00061 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00069 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00076 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00082 | .00006 | ..... | ..... | |
| 15,000 | 15,000 | .00089 | .00007 | .00007 | .00007 | |
| 16,000 | 16,000 | .00098 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00108 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00117 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00127 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00138 | .00011 | .00017 | .00010 | |
| 21,000 | 21,000 | .00148 | .00010 | ..... | ..... | |
| 22,000 | 22,000 | .00160 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00172 | .00012 | ..... | ..... | |
| 24,000 | 24,000 | .00188 | .00016 | ..... | ..... | |
| 25,000 | 25,000 | .00203 | .00015 | ..... | ..... | |
| 26,000 | 26,000 | .00220 | .00017 | ..... | ..... | |
| 27,000 | 27,000 | .00238 | .00018 | ..... | ..... | |
| 28,000 | 28,000 | .00261 | .00023 | .00073 | .00056 | |
| 34,420 | 34,420 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 3".2 from neck. Appearance fine granular, light gray.

## RACER.

### No. 6245.

Marks, R 142.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | | | |
| 3,000 | 3,000 | .00011 | .00006 | | | |
| 4,000 | 4,000 | .00017 | .00006 | | | |
| 5,000 | 5,000 | .00022 | .00005 | | | |
| 6,000 | 6,000 | .00028 | .00006 | | | |
| 7,000 | 7,000 | .00033 | .00005 | | | |
| 8,000 | 8,000 | .00039 | .00006 | | | |
| 9,000 | 9,000 | .00046 | .00007 | | | |
| 10,000 | 10,000 | .00052 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00060 | .00008 | | | |
| 12,000 | 12,000 | .00067 | .00007 | | | |
| 13,000 | 13,000 | .00074 | .00007 | | | |
| 14,000 | 14,000 | .00081 | .00007 | | | |
| 15,000 | 15,000 | .00090 | .00009 | .00005 | .00004 | |
| 16,000 | 16,000 | .00100 | .00010 | | | |
| 17,000 | 17,000 | .00110 | .00010 | | | |
| 18,000 | 18,000 | .00120 | .00010 | | | |
| 19,000 | 19,000 | .00131 | .00011 | | | |
| 20,000 | 20,000 | .00142 | .00011 | .00020 | .00015 | |
| 21,000 | 21,000 | .00154 | .00012 | | | |
| 22,000 | 22,000 | .00170 | .00016 | | | |
| 23,000 | 23,000 | .00185 | .00015 | | | |
| 24,000 | 24,000 | .00203 | .00018 | | | |
| 25,000 | 25,000 | .00221 | .00018 | | | |
| 26,000 | 26,000 | .00249 | .00028 | | | |
| 27,000 | 27,000 | .00274 | .00025 | .00090 | .00070 | |
| 33,750 | 33,750 | | | | | Tensile strength. |

Fractured 2".6 from neck. Appearance fine granular, light gray.

## RACER.

### No. 6247.

Marks, R 144.
Diameter, 1″.129.
Sectional area, 1.00 square inch
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00016 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00021 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00032 | .00004 | ..... | ..... | |
| 8,000 | 8,000 | .00039 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00046 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00005 | .00003 | .00003 | |
| 11,000 | 11,000 | .00060 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00067 | .00007 | ..... | ..... | |
| 13,000 | 13,000 | .00073 | .00006 | ..... | ..... | |
| 14,000 | 14,000 | .00082 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00090 | .00008 | .00010 | .00007 | |
| 16,000 | 16,000 | .00099 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00109 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00118 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00128 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00139 | .00011 | .00021 | .00011 | |
| 21,000 | 21,000 | .00150 | .00011 | ..... | ..... | |
| 22,000 | 22,000 | .00161 | .00011 | ..... | ..... | |
| 23,000 | 23,000 | .00177 | .00016 | ..... | ..... | |
| 24,000 | 24,000 | .00190 | .00013 | ..... | ..... | |
| 25,000 | 25,000 | .00210 | .00020 | ..... | ..... | |
| 26,000 | 26,000 | .00227 | .00017 | ..... | ..... | |
| 27,000 | 27,000 | .00251 | .00024 | .00078 | .00057 | |
| 32,900 | 32,900 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.3 from neck. Appearance fine granular, gray.

## RACER.

## No. 6249.

Marks, R 146.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 2,000 | 2,000 | .00004 | .00004 | ..... | ..... | |
| 3,000 | 3,000 | .00009 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00013 | .00004 | ..... | ..... | |
| 5,000 | 5,000 | .00019 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00024 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00081 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00039 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00044 | .00005 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00007 | .00001 | .00001 | |
| 11,000 | 11,000 | .00058 | .00007 | ..... | ..... | |
| 12,000 | 12,000 | .00066 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00073 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00080 | .00007 | ..... | ..... | |
| 15,000 | 15,000 | .00089 | .00009 | .00007 | .00006 | |
| 16,000 | 16,000 | .00099 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00108 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00119 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00128 | .00009 | ..... | ..... | |
| 20,000 | 20,000 | .00139 | .00011 | .00021 | .00014 | |
| 21,000 | 21,000 | .00151 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00163 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00179 | .00016 | ..... | ..... | |
| 24,000 | 24,000 | .00195 | .00016 | ..... | ..... | |
| 25,000 | 25,000 | .00210 | .00015 | ..... | ..... | |
| 26,000 | 26,000 | .00233 | .00023 | ..... | ..... | |
| 27,000 | 27,000 | .00258 | .00025 | .00078 | .00057 | |
| 33,690 | 33,690 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 1″.6 from neck. Appearance, fine granular, light gray.

## RACER.

### No. 6251.

Marks, R 148.
Diameter, 1″.129.
Sectional area, 1.00 square inch
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00011 | .00005 | | | |
| 4,000 | 4,000 | .00017 | .00006 | | | |
| 5,000 | 5,000 | .00022 | .00005 | | | |
| 6,000 | 6,000 | .00029 | .00007 | | | |
| 7,000 | 7,000 | .00036 | .00007 | | | |
| 8,000 | 8,000 | .00042 | .00006 | | | |
| 9,000 | 9,000 | .00050 | .00008 | | | |
| 10,000 | 10,000 | .00057 | .00007 | .00002 | .00002 | |
| 11,000 | 11,000 | .00063 | .00006 | | | |
| 12,000 | 12,000 | .00071 | .00008 | | | |
| 13,000 | 13,000 | .00080 | .00009 | | | |
| 14,000 | 14,000 | .00089 | .00009 | | | |
| 15,000 | 15,000 | .00099 | .00010 | .00011 | .00009 | |
| 16,000 | 16,000 | .00109 | .00010 | | | |
| 17,000 | 17,000 | .00119 | .00010 | | | |
| 18,000 | 18,000 | .00130 | .00011 | | | |
| 19,000 | 19,000 | .00141 | .00011 | | | |
| 20,000 | 20,000 | .00153 | .00012 | .00028 | .00017 | |
| 21,000 | 21,000 | .00170 | .00017 | | | |
| 22,000 | 22,000 | .00188 | .00018 | | | |
| 23,000 | 23,000 | .00204 | .00016 | | | |
| 24,000 | 24,000 | .00226 | .00022 | | | |
| 25,100 | 25,000 | .00250 | .00024 | .00079 | .00051 | |
| 29,400 | 29,400 | | | | | Tensile strength. |

Fractured ″.5 from neck. Appearance, granular, gray.

## RACER.

### No. 6266.

Marks, R 149.
Diameter, 1″. 129.
Sectional area, 1.00 square inch
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00004 | .00004 | | | |
| 3,000 | 3,000 | .00010 | .00006 | | | |
| 4,000 | 4,000 | .00015 | .00005 | | | |
| 5,000 | 5,000 | .00021 | .00006 | | | |
| 6,000 | 6,000 | .00028 | .00007 | | | |
| 7,000 | 7,000 | .00032 | .00004 | | | |
| 8,000 | 8,000 | .00038 | .00006 | | | |
| 9,000 | 9,000 | .00044 | .00006 | | | |
| 10,000 | 10,000 | .00052 | .00008 | .00001 | .00001 | |
| 11,000 | 11,000 | .00058 | .00006 | | | |
| 12,000 | 12,000 | .00065 | .00007 | | | |
| 13,000 | 13,000 | .00072 | .00007 | | | |
| 14,000 | 14,000 | .00080 | .00008 | | | |
| 15,000 | 15,000 | .00088 | .00008 | .00005 | .00004 | |
| 16,000 | 16,000 | .00096 | .00008 | | | |
| 17,000 | 17,000 | .00104 | .00008 | | | |
| 18,000 | 18,000 | .00113 | .00009 | | | |
| 19,000 | 19,000 | .00122 | .00009 | | | |
| 20,000 | 20,000 | .00132 | .00010 | .00016 | .00011 | |
| 21,000 | 21,000 | .00144 | .00012 | | | |
| 22,000 | 22,000 | .00155 | .00011 | | | |
| 23,000 | 23,000 | .00169 | .00014 | | | |
| 24,000 | 24,000 | .00181 | .00012 | | | |
| 25,000 | 25,000 | .00198 | .00017 | | | |
| 26,000 | 26,000 | .00212 | .00014 | | | |
| 27,000 | 27,000 | .00231 | .00019 | | | |
| 28,000 | 28,000 | .00256 | .00025 | .00073 | .00057 | |
| 33,320 | 33,320 | | | | | Tensile strength. |

Fractured ″.75 from neck. Appearance, fine granular, light gray, mottled.

## RACER.

### No. 6268.

Marks, R 151.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00012 | .00006 | | | |
| 4,000 | 4,000 | .00019 | .00007 | | | |
| 5,000 | 5,000 | .00024 | .00005 | | | |
| 6,000 | 6,000 | .00030 | .00006 | | | |
| 7,000 | 7,000 | .00037 | .00007 | | | |
| 8,000 | 8,000 | .00042 | .00005 | | | |
| 9,000 | 9,000 | .00049 | .00007 | | | |
| 10,000 | 10,000 | .00057 | .00008 | .00002 | .00002 | |
| 11,000 | 11,000 | .00063 | .00006 | | | |
| 12,000 | 12,000 | .00070 | .00007 | | | |
| 13,000 | 13,000 | .00079 | .00009 | | | |
| 14,000 | 14,000 | .00088 | .00009 | | | |
| 15,000 | 15,000 | .00098 | .00010 | .00010 | .00008 | |
| 16,000 | 16,000 | .00106 | .00008 | | | |
| 17,000 | 17,000 | .00117 | .00011 | | | |
| 18,000 | 18,000 | .00127 | .00010 | | | |
| 19,000 | 19,000 | .00139 | .00012 | | | |
| 20,000 | 20,000 | .00151 | .00012 | .00025 | .00015 | |
| 21,000 | 21,000 | .00163 | .00012 | | | |
| 22,000 | 22,000 | .00179 | .00016 | | | |
| 23,000 | 23,000 | .00194 | .00015 | | | |
| 24,000 | 24,000 | .00217 | .00023 | | | |
| 25,000 | 25,000 | .00239 | .00022 | | | |
| 26,000 | 26,000 | .00261 | .00022 | .00082 | .00057 | |
| 30,900 | 30,900 | | | | | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray, mottled.

## RACER.

No. 6285.

Marks, R 152.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | | | |
| 3,000 | 3,000 | .00010 | .00005 | | | |
| 4,000 | 4,000 | .00015 | .00005 | | | |
| 5,000 | 5,000 | .00021 | .00006 | | | |
| 6,000 | 6,000 | .00027 | .00006 | | | |
| 7,000 | 7,000 | .00032 | .00005 | | | |
| 8,000 | 8,000 | .00040 | .00008 | | | |
| 9,000 | 9,000 | .00046 | .00006 | | | |
| 10,000 | 10,000 | .00052 | .00006 | 0. | | |
| 11,000 | 11,000 | .00060 | .00008 | | | |
| 12,000 | 12,000 | .00067 | .00007 | | | |
| 13,000 | 13,000 | .00073 | .00006 | | | |
| 14,000 | 14,000 | .00081 | .00008 | | | |
| 15,000 | 15,000 | .00090 | .00009 | .00006 | .00006 | |
| 16,000 | 16,000 | .00099 | .00009 | | | |
| 17,000 | 17,000 | .00108 | .00009 | | | |
| 18,000 | 18,000 | .00118 | .00010 | | | |
| 19,000 | 19,000 | .00128 | .00010 | | | |
| 20,000 | 20,000 | .00140 | .00012 | .00019 | .00013 | |
| 21,000 | 21,000 | .00152 | .00012 | | | |
| 22,000 | 22,000 | .00163 | .00011 | | | |
| 23,000 | 23,000 | .00179 | .00016 | | | |
| 24,000 | 24,000 | .00200 | .00021 | | | |
| 25,000 | 25,000 | .00217 | .00017 | | | |
| 26,000 | 26,000 | .00240 | .00023 | | | |
| 27,000 | 27,000 | .00262 | .00022 | .00061 | .00062 | |
| 33,670 | 33,670 | | | | | Tensile strength. |

Fractured ″.55 from neck. Appearance, fine granular, light gray.

## RACER.

No. 6287.

Marks, R 155.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10."
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00004 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00039 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00046 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00050 | .00004 | .00001 | .00001 | |
| 11,000 | 11,000 | .00058 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00067 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00073 | .00006 | ..... | ..... | |
| 14,000 | 14,000 | .00079 | .00006 | ..... | ..... | |
| 15,000 | 15,000 | .00087 | .00008 | .00007 | .00006 | |
| 16,000 | 16,000 | .00096 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00102 | .00006 | ..... | ..... | |
| 18,000 | 18,000 | .00110 | .00008 | ..... | ..... | |
| 19,000 | 19,000 | .00120 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00130 | .00010 | 00017 | .00010 | |
| 21,000 | 21,000 | .00140 | .00010 | ..... | ..... | |
| 22,000 | 22,000 | .00151 | .00011 | ..... | ..... | |
| 23,000 | 23,000 | .00162 | .00011 | ..... | ..... | |
| 24,000 | 24,000 | .09178 | .00016 | ..... | ..... | |
| 25,000 | 25,000 | .00192 | .00014 | ..... | ..... | |
| 26,000 | 26,000 | .00212 | .00020 | ..... | ..... | |
| 27,000 | 27,000 | .00230 | .00018 | ..... | ..... | |
| 28,000 | 28,000 | .00252 | .00022 | .00075 | .00058 | |
| 35,300 | 35,300 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 3".6 from neck. Appearance, fine granular, light gray.

## RACER.

### No. 6304.

Marks, R 159.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00012 | .00006 | | | |
| 4,000 | 4,000 | .00018 | .00006 | | | |
| 5,000 | 5,000 | .00022 | .00004 | | | |
| 6,000 | 6,000 | .00028 | .00006 | | | |
| 7,000 | 7,000 | .00033 | .00005 | | | |
| 8,000 | 8,000 | .00040 | .00007 | | | |
| 9,000 | 9,000 | .00047 | .00007 | | | |
| 10,000 | 10,000 | .00053 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00060 | .00007 | | | |
| 12,000 | 12,000 | .00068 | .00008 | | | |
| 13,000 | 13,000 | .00075 | .00007 | | | |
| 14,000 | 14,000 | .00083 | .00008 | | | |
| 15,000 | 15,000 | .00091 | .00008 | .00009 | .00008 | |
| 16,000 | 16,000 | .00102 | .00011 | | | |
| 17,000 | 17,000 | .00110 | .00008 | | | |
| 18,000 | 18,000 | .00119 | .00009 | | | |
| 19,000 | 19,000 | .00129 | .00010 | | | |
| 20,000 | 20,000 | .00140 | .00011 | .00020 | .00011 | |
| 21,000 | 21,000 | .00151 | .00011 | | | |
| 22,000 | 22,000 | .00164 | .00013 | | | |
| 23,000 | 23,000 | .00180 | .00016 | | | |
| 24,000 | 24,000 | .00198 | .00018 | | | |
| 25,000 | 25,000 | .00212 | .00019 | | | |
| 26,000 | 26,000 | .00232 | .00020 | | | |
| 27,000 | 27,000 | .00256 | .00024 | .00078 | .00058 | |
| 84,100 | 84,100 | | | | | Tensile strength. |

Fractured ″.85 from neck. Appearance, fine granular, gray.

## RACER.

### No. 6325.

**Marks, R 160.**
**Diameter, 1″.129.**
**Sectional area, 1.00 square inch**
**Length of stem, 10″.**
**Gauged length, 10″.**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00016 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00020 | .00004 | ..... | ..... | |
| 6,000 | 6,000 | .00026 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00031 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00038 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00045 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00051 | .00006 | .00001 | .00001 | |
| 11,000 | 11,000 | .00059 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00067 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00074 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00081 | .00007 | ..... | ..... | |
| 15,000 | 15,000 | .00090 | .00009 | .00007 | .00006 | |
| 16,000 | 16,000 | .00100 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00110 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00120 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00131 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00141 | .00010 | .00020 | .00013 | |
| 21,000 | 21,000 | .00153 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00169 | .00016 | ..... | ..... | |
| 23,000 | 23,000 | .00184 | .00015 | ..... | ..... | |
| 24,000 | 24,000 | .00204 | .00020 | ..... | ..... | |
| 25,000 | 25,000 | .00226 | .00022 | ..... | ..... | |
| 26,000 | 26,000 | .00249 | .00023 | .00073 | .00053 | |
| 34,500 | 34,500 | ..... | ..... | ..... | ..... | Tensile strength. |

**Fractured 1″.2 from neck. Appearance, fine granular, gray.**

## RACER.

### No. 6327.

Marks, R 162.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00023 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00036 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00042 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00049 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00057 | .00008 | .00002 | .00002 | |
| 11,000 | 11,000 | .00062 | .00005 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00077 | .00007 | ..... | ..... | |
| 14,000 | 14,000 | .00086 | .00009 | ..... | ..... | |
| 15,000 | 15,000 | .00094 | .00008 | .00008 | .00006 | |
| 16,000 | 16,000 | .00102 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00113 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00121 | .00008 | ..... | ..... | |
| 19,000 | 19,000 | .00133 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00146 | .00013 | .00020 | .00012 | |
| 21,000 | 21,000 | .00157 | .00011 | ..... | ..... | |
| 22,000 | 22,000 | .00172 | .00015 | ..... | ..... | |
| 23,000 | 23,000 | .00185 | .00013 | ..... | ..... | |
| 24,000 | 24,000 | .00203 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00220 | .00017 | ..... | ..... | |
| 26,000 | 26,000 | .00241 | .00021 | ..... | ..... | |
| 27,000 | 27,000 | .00269 | .00028 | .00064 | .00064 | |
| 84,390 | 84,390 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.7 from neck. Appearance, fine granular, gray.

## RACER.

### No. 6330.

Marks, R 165.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | | | |
| 3,000 | 3,000 | .00012 | .00006 | | | |
| 4,000 | 4,000 | .00017 | .00005 | | | |
| 5,000 | 5,000 | .00024 | .00007 | | | |
| 6,000 | 6,000 | .00029 | .00005 | | | |
| 7,000 | 7,000 | .00036 | .00007 | | | |
| 8,000 | 8,000 | .00041 | .00005 | | | |
| 9,000 | 9,000 | .00047 | .00006 | | | |
| 10,000 | 10,000 | .00056 | .00009 | .00004 | .00004 | |
| 11,000 | 11,000 | .00063 | .00007 | | | |
| 12,000 | 12,000 | .00069 | .00006 | | | |
| 13,000 | 13,000 | .00077 | .00008 | | | |
| 14,000 | 14,000 | .00086 | .00009 | | | |
| 15,000 | 15,000 | .00096 | .00010 | .00007 | .00003 | |
| 16,000 | 16,000 | .00105 | .00009 | | | |
| 17,000 | 17,000 | .00114 | .00009 | | | |
| 18,000 | 18,000 | .00123 | .00009 | | | |
| 19,000 | 19,000 | .00134 | .00011 | | | |
| 20,000 | 20,000 | .00146 | .00012 | .00017 | .00010 | |
| 21,000 | 21,000 | .00156 | .00010 | | | |
| 22,000 | 22,000 | .00168 | .00012 | | | |
| 23,000 | 23,000 | .00184 | .00016 | | | |
| 24,000 | 24,000 | .00196 | .00012 | | | |
| 25,000 | 25,000 | .00216 | .00020 | | | |
| 26,000 | 26,000 | .00236 | .00020 | | | |
| 27,000 | 27,000 | .00256 | .00020 | .00068 | .00051 | |
| 31,820 | 31,820 | | | | | Tensile strength. |

Fractured 1″ from the neck. Appearance, fine granular, light gray.

## RACER.

No. 6331.

Marks, R 166.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00020 | .00008 | ..... | ..... | |
| 5,000 | 5,000 | .00027 | .00007 | ..... | ..... | |
| 6,000 | 6,000 | .00033 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00040 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00048 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00055 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00062 | .00007 | .00004 | .00004 | |
| 11,000 | 11,000 | .00071 | .00009 | ..... | ..... | |
| 12,000 | 12,000 | .00080 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00090 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00100 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00110 | .00010 | .00017 | .00013 | |
| 16,000 | 16,000 | .00123 | .00013 | ..... | ..... | |
| 17,000 | 17,000 | .00138 | .00015 | ..... | ..... | |
| 18,000 | 18,000 | .00151 | .00013 | ..... | ..... | |
| 19,000 | 19,000 | .00171 | .00020 | ..... | ..... | |
| 20,000 | 20,000 | .00190 | .00019 | .00050 | .00033 | |
| 21,000 | 21,000 | .00219 | .00029 | ..... | ..... | |
| 22,000 | 22,000 | .00245 | .00026 | ..... | ..... | |
| 23,000 | 23,000 | .00277 | .00032 | ..... | ..... | |
| 24,000 | 24,000 | .00319 | .00042 | ..... | ..... | |
| 25,000 | 25,000 | .00371 | .00052 | .00182 | .00132 | |
| 29,900 | 29,900 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ".3 from neck. Appearance, fine granular, gray.

## RACER.

### No. 6370.

Marks, R 168.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00007 | .00007 | ..... | ..... | |
| 3,000 | 3,000 | .00012 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00020 | .00008 | ..... | ..... | |
| 5,000 | 5,000 | .00026 | .00006 | ..... | ..... | |
| 6,000 | 6,000 | .00031 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00039 | .00008 | ..... | ..... | |
| 8,000 | 8,000 | .00046 | .00007 | ..... | ..... | |
| 9,000 | 9,000 | .00053 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00061 | .00008 | .00002 | .00002 | |
| 11,000 | 11,000 | .00069 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00078 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00088 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00098 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00108 | .00010 | .00010 | .00008 | |
| 16,000 | 16,000 | .00119 | .00011 | ..... | ..... | |
| 17,000 | 17,000 | .00130 | .00011 | ..... | ..... | |
| 18,000 | 18,000 | .00142 | .00012 | ..... | ..... | |
| 19,000 | 19,000 | .00157 | .00015 | ..... | ..... | |
| 20,000 | 20,000 | .00171 | .00014 | .00080 | .00020 | |
| 21,000 | 21,000 | .00189 | .00018 | ..... | ..... | |
| 22,000 | 22,000 | .00210 | .00021 | ..... | ..... | |
| 23,000 | 23,000 | .00230 | .00020 | ..... | ..... | |
| 24,000 | 24,000 | .00255 | .00025 | ..... | ..... | |
| 25,000 | 25,000 | .00289 | .00085 | .00101 | .00071 | |
| 30,990 | 30,990 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured, ".75 from neck. Appearance, fine granular, gray.

## RACER.

### No. 6371.

Marks, R 169.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00018 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00007 | ..... | ..... | |
| 6,000 | 6,000 | .00031 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00038 | .00007 | ..... | ..... | |
| 8,000 | 8,000 | .00046 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00051 | .00005 | ..... | ..... | |
| 10,000 | 10,000 | .00059 | .00008 | .00002 | .00002 | |
| 11,000 | 11,000 | .00067 | .00008 | ..... | ..... | |
| 12,000 | 12,000 | .00076 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00084 | .00008 | ..... | ..... | |
| 14,000 | 14,000 | .00091 | .00007 | ..... | ..... | |
| 15,000 | 15,000 | .00100 | .00009 | .00008 | .00006 | |
| 16,000 | 16,000 | .00108 | .00008 | ..... | ..... | |
| 17,000 | 17,000 | .00120 | .00012 | ..... | ..... | |
| 18,000 | 18,000 | .00131 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00143 | .00012 | ..... | ..... | |
| 20,000 | 20,000 | .00156 | .00013 | .00025 | .00017 | |
| 21,000 | 21,000 | .00170 | .00014 | ..... | ..... | |
| 22,000 | 22,000 | .00187 | .00017 | ..... | ..... | |
| 23,000 | 23,000 | .00202 | .00015 | ..... | ..... | |
| 24,000 | 24,000 | .00220 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00250 | .00030 | .00072 | .00047 | |
| 31,700 | 31,700 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.65 from neck. Appearance, fine granular, gray.

# DICKSON DYNAMITE GUN.

## CAST-IRON BARRELS.

No. 6189.

Marks, 135.
Diameter, 1".129.
Sectional area, 1.00 square inch.
Length of stem, 10".
Gauged length, 10".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00006 | .00006 | ..... | ..... | |
| 3,000 | 3,000 | .00011 | .00006 | ..... | ..... | |
| 4,000 | 4,000 | .00017 | .00006 | ..... | ..... | |
| 5,000 | 5,000 | .00022 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00028 | .00006 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00041 | .00008 | ..... | ..... | |
| 9,000 | 9,000 | .00048 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00055 | .00007 | .00002 | .00002 | |
| 11,000 | 11,000 | .00061 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00070 | .00009 | ..... | ..... | |
| 13,000 | 13,000 | .00076 | .00006 | ..... | ..... | |
| 14,000 | 14,000 | .00082 | .00006 | ..... | ..... | |
| 15,000 | 15,000 | .00091 | .00009 | .00009 | .00007 | |
| 16,000 | 16,000 | .00098 | .00007 | ..... | ..... | |
| 17,000 | 17,000 | .00110 | .00012 | ..... | ..... | |
| 18,000 | 18,000 | .00119 | .00009 | ..... | ..... | |
| 19,000 | 19,000 | .00130 | .00011 | ..... | ..... | |
| 20,000 | 20,000 | .00140 | .00010 | .00020 | .00011 | |
| 21,000 | 21,000 | .00152 | .00012 | ..... | ..... | |
| 22,000 | 22,000 | .00164 | .00012 | ..... | ..... | |
| 23,000 | 23,000 | .00180 | .00016 | ..... | ..... | |
| 24,000 | 24,000 | .00198 | .00018 | ..... | ..... | |
| 25,000 | 25,000 | .00216 | .00018 | ..... | ..... | |
| 26,000 | 26,000 | .00235 | .00019 | ..... | ..... | |
| 27,000 | 27,000 | .00260 | .00025 | .00061 | .00061 | |
| 31,900 | 31,900 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray, mottled.

No. 6192.

Marks, $\frac{12\text{-}19}{1000}$.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 2″.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00010 | .00010 | ..... | ..... | |
| 3,000 | 3,000 | .00020 | .00010 | ..... | ..... | |
| 4,000 | 4,000 | .00025 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00030 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00040 | .00010 | ..... | ..... | |
| 7,000 | 7,000 | .00045 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00050 | .00005 | ..... | ..... | |
| 9,000 | 9,000 | .00060 | .00010 | ..... | ..... | |
| 10,000 | 10,000 | .00070 | .00010 | .00005 | .00005 | |
| 11,000 | 11,000 | .00075 | .00005 | ..... | ..... | |
| 12,000 | 12,000 | .00085 | .00010 | ..... | ..... | |
| 13,000 | 13,000 | .00095 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00105 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00125 | .00020 | .00020 | .00015 | |
| 16,000 | 16,000 | .00135 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00150 | .00015 | ..... | ..... | |
| 18,000 | 18,000 | .00160 | .00010 | ..... | ..... | |
| 19,000 | 19,000 | .00170 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00190 | .00020 | .00040 | .00020 | |
| 21,000 | 21,000 | .00210 | .00020 | ..... | ..... | |
| 22,000 | 22,000 | .00225 | .00015 | ..... | ..... | |
| 23,000 | 23,000 | .00245 | .00020 | ..... | ..... | |
| 24,000 | 24,000 | .00280 | .00035 | ..... | ..... | |
| 25,000 | 25,000 | .00310 | .00030 | .00105 | .00065 | |
| 28,950 | 28,950 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.2 from neck. Appearance, fine granular, dark gray.

No. 6214.

Marks, 1–7–99.
Diameter, 1″.129.
Sectional area, 1.00 square inch
Length of stem, 2″.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00015 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00020 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00025 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00035 | .00010 | ..... | ..... | |
| 8,000 | 8,000 | .00040 | .00005 | ..... | ..... | |
| 9,000 | 9,000 | .00050 | .00010 | ..... | ..... | |
| 10,000 | 10,000 | .00060 | .00010 | .00005 | .00005 | |
| 11,000 | 11,000 | .00070 | .00010 | ..... | ..... | |
| 12,000 | 12,000 | .00080 | .00010 | ..... | ..... | |
| 13,000 | 13,000 | .00090 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00100 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00110 | .00010 | .00015 | .00010 | |
| 16,000 | 16,000 | .00120 | .00010 | ..... | ..... | |
| 17,000 | 17,000 | .00130 | .00010 | ..... | ..... | |
| 18,000 | 18,000 | .00145 | .00015 | ..... | ..... | |
| 19,000 | 19,000 | .00160 | .00015 | ..... | ..... | |
| 20,000 | 20,000 | .00180 | .00020 | .00046 | .00025 | |
| 21,000 | 21,000 | .00205 | .00025 | ..... | ..... | |
| 22,000 | 22,000 | .00230 | .00025 | ..... | ..... | |
| 23,000 | 23,000 | .00260 | .00030 | ..... | ..... | |
| 24,000 | 24,000 | .00300 | .00040 | ..... | ..... | |
| 25,000 | 25,000 | .00345 | .00045 | .00155 | .00115 | |
| 30,150 | 30,150 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 6″ from neck. Appearance, fine granular, gray.

No. 6215.

Marks, 137.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 10″.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00004 | .00004 | ..... | ..... | |
| 3,000 | 3,000 | .00009 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00016 | .00007 | ..... | ..... | |
| 5,000 | 5,000 | .00020 | .00004 | ..... | ..... | |
| 6,000 | 6,000 | .00027 | .00007 | ..... | ..... | |
| 7,000 | 7,000 | .00033 | .00006 | ..... | ..... | |
| 8,000 | 8,000 | .00039 | .00006 | ..... | ..... | |
| 9,000 | 9,000 | .00046 | .00007 | ..... | ..... | |
| 10,000 | 10,000 | .00052 | .00006 | .00002 | .00002 | |
| 11,000 | 11,000 | .00058 | .00006 | ..... | ..... | |
| 12,000 | 12,000 | .00066 | .00008 | ..... | ..... | |
| 13,000 | 13,000 | .00075 | .00009 | ..... | ..... | |
| 14,000 | 14,000 | .00083 | .00008 | ..... | ..... | |
| 15,000 | 15,000 | .00091 | .00008 | .00007 | .00005 | |
| 16,000 | 16,000 | .00100 | .00009 | ..... | ..... | |
| 17,000 | 17,000 | .00109 | .00009 | ..... | ..... | |
| 18,000 | 18,000 | .00120 | .00011 | ..... | ..... | |
| 19,000 | 19,000 | .00130 | .00010 | ..... | ..... | |
| 20,000 | 20,000 | .00139 | .00009 | .00017 | .00010 | |
| 21,000 | 21,000 | .00150 | .00011 | ..... | ..... | |
| 22,000 | 22,000 | .00161 | .00011 | ..... | ..... | |
| 23,000 | 23,000 | .00174 | .00013 | ..... | ..... | |
| 24,000 | 24,000 | .00190 | .00016 | ..... | ..... | |
| 25,000 | 25,000 | .00207 | .00017 | ..... | ..... | |
| 26,000 | 26,000 | .00222 | .00015 | ..... | ..... | |
| 27,000 | 27,000 | .00245 | .00023 | ..... | ..... | |
| 28,000 | 28,000 | .00268 | .00023 | .00074 | .00057 | |
| 33,810 | 33,810 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured 4″.5 from neck. Appearance, granular, light gray, mottled.

No. 6252.

Marks, 2–11–99.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 2″.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00010 | .00010 | ..... | ..... | |
| 3,000 | 3,000 | .00015 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00020 | .00005 | ..... | ..... | |
| 5,000 | 5,000 | .00025 | .00005 | ..... | ..... | |
| 6,000 | 6,000 | .00030 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00035 | .00005 | ..... | ..... | |
| 8,000 | 8,000 | .00045 | .00010 | ..... | ..... | |
| 9,000 | 9,000 | .00055 | .00010 | ..... | ..... | |
| 10,000 | 10,000 | .00065 | .00010 | .00005 | .00005 | |
| 11,000 | 11,000 | .00080 | .00015 | ..... | ..... | |
| 12,000 | 12,000 | .00090 | .00010 | ..... | ..... | |
| 13,000 | 13,000 | .00100 | .00010 | ..... | ..... | |
| 14,000 | 14,000 | .00110 | .00010 | ..... | ..... | |
| 15,000 | 15,000 | .00125 | .00015 | .00015 | .00010 | |
| 16,000 | 16,000 | .00140 | .00015 | ..... | ..... | |
| 17,000 | 17,000 | .00155 | .00015 | ..... | ..... | |
| 18,000 | 18,000 | .00175 | .00020 | ..... | ..... | |
| 19,000 | 19,000 | .00195 | .00020 | ..... | ..... | |
| 20,000 | 20,000 | .00220 | .00025 | .00060 | .00045 | |
| 21,000 | 21,000 | .00250 | .00030 | ..... | ..... | |
| 22,000 | 22,000 | .00285 | .00035 | ..... | ..... | |
| 23,000 | 23,000 | .00330 | .00045 | ..... | ..... | |
| 24,000 | 24,000 | .00385 | .00055 | ..... | ..... | |
| 25,000 | 25,000 | .00470 | .00085 | .00255 | .00195 | |
| 26,980 | 26,980 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured .″25 from neck. Appearance, granular, gray.

No. 6269.

Marks, 2–23.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 2″.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds* | *Pounds* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .00005 | .00005 | ..... | ..... | |
| 3,000 | 3,000 | .00010 | .00005 | ..... | ..... | |
| 4,000 | 4,000 | .00020 | .00010 | ..... | ..... | |
| 5,000 | 5,000 | .00030 | .00010 | ..... | ..... | |
| 6,000 | 6,000 | .00035 | .00005 | ..... | ..... | |
| 7,000 | 7,000 | .00045 | .00010 | ..... | ..... | |
| 8,000 | 8,000 | .00055 | .00010 | ..... | ..... | |
| 9,000 | 9,000 | .00065 | .00010 | ..... | ..... | |
| 10,000 | 10,000 | .00080 | .00015 | .00015 | .00015 | |
| 11,000 | 11,000 | .00095 | .00015 | ..... | ..... | |
| 12,000 | 12,000 | .00110 | .00015 | ..... | ..... | |
| 13,000 | 13,000 | .00125 | .00015 | ..... | ..... | |
| 14,000 | 14,000 | .00140 | .00015 | ..... | ..... | |
| 15,000 | 15,000 | .00155 | .00015 | .00040 | .00025 | |
| 16,000 | 16,000 | .00180 | .00025 | ..... | ..... | |
| 17,000 | 17,000 | .00205 | .00025 | ..... | ..... | |
| 18,000 | 18,000 | .00230 | .00025 | ..... | ..... | |
| 19,000 | 19,000 | .00270 | .00040 | ..... | ..... | |
| 20,000 | 20,000 | .00315 | .00045 | .00140 | .00100 | |
| 21,000 | 21,000 | .00370 | .00055 | ..... | ..... | |
| 22,000 | 22,000 | .00435 | .00065 | ..... | ..... | |
| 23,000 | 23,000 | .00510 | .00075 | ..... | ..... | |
| 24,000 | 24,000 | .00635 | .00125 | ..... | ..... | |
| 25,000 | 25,000 | .00815 | .00180 | .00575 | .00435 | |
| 25,710 | 25.710 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.25 from neck. Appearance, fine granular, dark gray.

No. 6333.

Marks, 4–14.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Length of stem, 2″.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | |
| 2,000 | 2,000 | .000100 | .000100 | ..... | ..... | |
| 3,000 | 3,000 | .000200 | .000100 | ..... | ..... | |
| 4,000 | 4,000 | .000250 | .000050 | ..... | ..... | |
| 5,000 | 5,000 | .000300 | .000050 | ..... | ..... | |
| 6,000 | 6,000 | .000350 | .000050 | ..... | ..... | |
| 7,000 | 7,000 | .000400 | .000050 | ..... | ..... | |
| 8,000 | 8,000 | .000500 | .000100 | ..... | ..... | |
| 9,000 | 9,000 | .000600 | .000100 | ..... | ..... | |
| 10,000 | 10,000 | .000650 | .000050 | 0. | ..... | |
| 11,000 | 11,000 | .000750 | .000100 | ..... | ..... | |
| 12,000 | 12,000 | .000800 | .000050 | ..... | ..... | |
| 13,000 | 13,000 | .000950 | .000150 | ..... | ..... | |
| 14,000 | 14,000 | .001050 | .000100 | ..... | ..... | |
| 15,000 | 15,000 | .001150 | .000100 | .000150 | .000150 | |
| 16,000 | 16,000 | .001300 | .000150 | ..... | ..... | |
| 17,000 | 17,000 | .001400 | .000100 | ..... | ..... | |
| 18,000 | 18,000 | .001550 | .000150 | ..... | ..... | |
| 19,000 | 19,000 | .001750 | .000200 | ..... | ..... | |
| 20,000 | 20,000 | .001900 | .000150 | .000400 | .000250 | |
| 21,000 | 21,000 | .002100 | .000200 | ..... | ..... | |
| 22,000 | 22,000 | .002350 | .000250 | ..... | ..... | |
| 23,000 | 23,000 | .002650 | .000300 | ..... | ..... | |
| 24,000 | 24,000 | .002900 | .000250 | ..... | ..... | |
| 25,000 | 25,000 | .003350 | .000450 | .001350 | .000950 | |
| 29,200 | 29,200 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured ″.3 from the neck. Appearance, fine granular, dark gray.

# CAST IRON

FROM

# WATERTOWN ARSENAL FOUNDRY

AND

# PIG IRONS.

The specimens of cast iron were taken from cylinders 18″ long by 8″ diameter, cored 3½″ diameter, poured from the same metal as the castings they represented.

Specimens of pig iron were turned down directly from sample pigs.

The furnace charges were as follows:

The scrap iron used was heads of shot and shell of previous casts, old shot and shell, bolsters, and gun-carriage scrap of good quality.

| Date of cast. | Furnace charge. | Pounds. | Furnace. | No. of tension test. |
|---|---|---|---|---|
| February 21, 1899 | Muirkirk pig | 2,000 | Cupola | 5936 |
| | Salisbury carbonate pig | 3,500 | | |
| | Scrap | 6,100 | | |
| | Total | 11,600 | | |
| February 25, 1899 | Muirkirk pig | 6,000 | Air furnace | 5930 |
| | Salisbury carbonate pig | 18,000 | | |
| | Scrap | 24,000 | | |
| | Total | 48,000 | | |
| March 1, 1899 | Muirkirk pig | 4,000 | Cupola | 5937 |
| | Salisbury carbonate pig | 8,000 | | |
| | Scrap | 8,000 | | |
| | Total | 20,000 | | |
| March 3, 1899 | Muirkirk pig | 4,000 | Cupola | 5944 |
| | Salisbury carbonate pig | 2,000 | | |
| | Scrap | 12,000 | | |
| | Total | 18,000 | | |
| March 7, 1899 | Muirkirk pig | 2,000 | Air furnace | 5934 |
| | Salisbury carbonate pig | 4,000 | | |
| | Soft pig | 8,000 | | |
| | Scrap | 16,000 | | |
| | Total | 30,000 | | |
| March 9, 1899 | Muirkirk pig | 4,000 | Cupola | 5939 |
| | Salisbury pig | 4,000 | | |
| | Soft pig | 3,000 | | |
| | Scrap | 10,000 | | |
| | Total | 21,000 | | |
| March 11, 1899 | Muirkirk pig | 2,000 | Air furnace | 5940 |
| | Salisbury carbonate pig | 4,000 | | |
| | Soft pig | 10,000 | | |
| | Scrap | 14,000 | | |
| | Total | 30,000 | | |
| March 14, 1899 | Muirkirk pig | 2,000 | Air furnace | 5941 |
| | Salisbury pig | 7,000 | | |
| | Soft pig | 7,500 | | |
| | Scrap | 13,000 | | |
| | Total | 29,500 | | |
| March 16, 1899 | Muirkirk pig | 4,000 | Air furnace | 5943 |
| | Salisbury pig | 9,000 | | |
| | Soft pig | 8,000 | | |
| | Scrap | 5,000 | | |
| | Total | 26,000 | | |
| March 21, 1899 | Muirkirk pig | 3,000 | Air furnace | 5945 |
| | Salisbury pig | 11,000 | | |
| | Soft pig | 11,000 | | |
| | Scrap | 15,000 | | |
| | Total | 40,000 | | |

| Date of cast. | Furnace charge. | Pounds. | Furnace. | No. of tension test. |
|---|---|---|---|---|
| March 25, 1899 | Muirkirk pig | 1,500 | Air furnace | 5946 |
| | Salisbury pig | 6,500 | | |
| | Soft pig | 7,500 | | |
| | Scrap | 13,000 | | |
| | Total | 28,500 | | |
| March 29, 1899 | Muirkirk pig | 1,000 | Air furnace | 5947 |
| | Salisbury pig | 4,000 | | |
| | Soft pig | 7,000 | | |
| | Scrap | 14,000 | | |
| | Total | 26,000 | | |
| April 3, 1899 | Muirkirk pig | 1,000 | Air furnace | 5948 |
| | Salisbury pig | 5,000 | | |
| | Soft pig | 8,000 | | |
| | Scrap | 17,000 | | |
| | Total | 31,000 | | |
| April 15, 1899 | Muirkirk pig | 1,000 | Cupola | 5951 |
| | Salisbury pig | 1,000 | | |
| | Scrap | 16,000 | | |
| | Total | 18,000 | | |
| April 18, 1899 | Muirkirk pig | 2,000 | Cupola | 5953 |
| | Salisbury pig | 7,000 | | |
| | Scrap | 16,000 | | |
| | Total | 25,000 | | |
| April 22, 1899 | Muirkirk pig | 2,500 | Air furnace | 5955 |
| | Salisbury pig | 12,000 | | |
| | Soft pig | 8,000 | | |
| | Scrap | 17,000 | | |
| | Total | 39,000 | | |
| April 27, 1899 | Muirkirk pig | 1,500 | Air furnace | 5956 |
| | Salisbury pig | 5,000 | | |
| | Soft pig | 7,500 | | |
| | Scrap | 16,000 | | |
| | Total | 30,000 | | |
| May 5, 1899 | Muirkirk pig | 1,000 | Air furnace | 5957 |
| | Salisbury pig | 9,000 | | |
| | Soft pig | 7,000 | | |
| | Scrap | 19,000 | | |
| | Total | 36,000 | | |
| May 8, 1899 | Muirkirk pig | 1,000 | Air furnace | 5958 |
| | Salisbury pig | 5,000 | | |
| | Soft pig | 6,000 | | |
| | Scrap | 20,000 | | |
| | Total | 32,000 | | |
| May 15, 1899 | Salisbury pig | 6,000 | Air furnace | 5959 |
| | Soft pig | 6,000 | | |
| | Scrap | 24,000 | | |
| | Total | 36,000 | | |
| May 19, 1899 | Salisbury pig | 5,000 | Air furnace | 5964 |
| | Soft pig | 7,000 | | |
| | Scrap | 21,000 | | |
| | Total | 33,000 | | |
| May 23, 1899 | Salisbury pig | 7,000 | Air furnace | 5965 |
| | Soft pig | 7,000 | | |
| | Scrap | 26,000 | | |
| | Total | 40,000 | | |

| Date of cast. | Furnace charge. | | Furnace. | No. of tension test. |
|---|---|---|---|---|
| | | *Pounds.* | | |
| May 27, 1899 | Salisbury pig | 6,000 | Air furnace | 5966 |
| | Soft pig | 10,000 | | |
| | Scrap | 23,000 | | |
| | Total | 39,000 | | |
| June 2, 1899 | Salisbury pig | 6,000 | Air furnace | 5969 |
| | Soft pig | 8,000 | | |
| | Scrap | 20,000 | | |
| | Total | 34,000 | | |
| June 8, 1899 | Salisbury pig | 6,000 | Air furnace | 5971 |
| | Soft pig | 9,500 | | |
| | Scrap | 20,500 | | |
| | Total | 36,000 | | |
| June 14, 1899 | Salisbury pig | 6,000 | Air furnace | 5980 |
| | Soft pig | 10,000 | | |
| | Scrap | 24,500 | | |
| | Total | 40,500 | | |
| June 17, 1899 | Salisbury pig | 6,000 | Air furnace | 5981 |
| | Soft pig | 8,000 | | |
| | Scrap | 17,000 | | |
| | Total | 31,000 | | |
| June 22, 1899 | Salisbury pig | 6,000 | Air furnace | 5982 |
| | Soft pig | 9,000 | | |
| | Scrap | 18,000 | | |
| | Total | 33,000 | | |
| June 26, 1899 | Lake Superior pig | 1,500 | Air furnace | 5986 |
| | Salisbury pig | 6,000 | | |
| | Soft pig | 10,000 | | |
| | Scrap | 16,500 | | |
| | Total | 34,000 | | |

## 12-INCH SHOT AND SHELL.

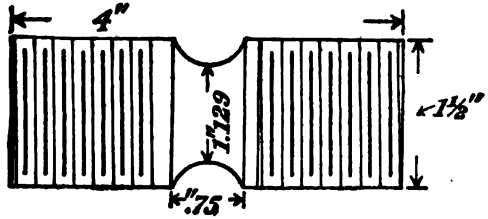
### No. 6358.

Marks, 60.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 6″.

| Applied loads | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .000033 | .000033 | ..... | ..... | |
| 3,000 | 3,000 | .000100 | .000067 | ..... | ..... | |
| 4,000 | 4,000 | .000150 | .000050 | ..... | ..... | |
| 5,000 | 5,000 | .000233 | .000083 | ..... | ..... | |
| 6,000 | 6,000 | .000317 | .000084 | ..... | ..... | |
| 7,000 | 7,000 | .000383 | .000066 | ..... | ..... | |
| 8,000 | 8,000 | .000467 | .000084 | ..... | ..... | |
| 9,000 | 9,000 | .000533 | .000066 | ..... | ..... | |
| 10,000 | 10,000 | .000633 | .000100 | 0. | ..... | |
| 11,000 | 11,000 | .000700 | .000067 | ..... | ..... | |
| 12,000 | 12,000 | .000783 | .000083 | ..... | ..... | |
| 13,000 | 13,000 | .000850 | .000067 | ..... | ..... | |
| 14,000 | 14,000 | .000950 | .000100 | ..... | ..... | |
| 15,000 | 15,000 | .001033 | .000083 | .000050 | .000050 | |
| 16,000 | 16,000 | .001150 | .000117 | ..... | ..... | |
| 17,000 | 17,000 | .001300 | .000150 | ..... | ..... | |
| 18,000 | 18,000 | .001417 | .000117 | ..... | ..... | |
| 19,000 | 19,000 | .001583 | .000166 | ..... | ..... | |
| 20,000 | 20,000 | .001717 | .000134 | .000333 | .000283 | |
| 21,000 | 21,000 | .001933 | .000216 | ..... | ..... | |
| 22,000 | 22,000 | .002150 | .000217 | ..... | ..... | |
| 23,000 | 23,000 | .002367 | .000217 | ..... | ..... | |
| 24,000 | 24,000 | .002683 | .000316 | ..... | ..... | |
| 25,000 | 25,000 | .003000 | .000317 | .001050 | .000717 | |
| 27,620 | 27,620 | ..... | ..... | ..... | ..... | Tensile strength. |

Fractured at the neck. Appearance, fine granular, light gray.

## Chemical Analyses and Tension Tests.




| No. of test. | Description. | Date of cast. | Chemical composition. | | | | | | | | Tensile strength per square inch. | Fracture. | Specific gravity. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Carbon. | | | Manganese. | Silicon. | Sulphur. | Phosphorus. | Copper. | | | |
| | | | Total. | Graphitic. | Combined. | | | | | | | | |
| | | | | | | | | | | | *Pounds.* | | |
| 5692 | 3.#2 shell | | | | | | | | | | 23,520 | Granular, gray | 7.1430 |
| 5693 | do | | | | | | | | | | 24,020 | do | 7.1982 |
| 5694 | do | | | | | | | | | | 24,970 | do | 7.1610 |
| 5695 | do | | | | | | | | | | 22,430 | Granular, gray, mottled | 7.1891 |
| 5704 | do | | | | | | | | | | 25,690 | Fine granular, gray | 7.1490 |
| 5705 | do | | | | | | | | | | 24,280 | do | 7.1420 |
| 5706 | do | | | | | | | | | | 23,400 | do | 7.1141 |
| 5707 | do | | | | | | | | | | 23,020 | do | |
| 5711 | do | | 3.122 | 2.508 | 0.614 | 0.365 | 1.015 | 0.100 | 0.511 | | 24,410 | Granular, gray | 7.1982 |
| 5712 | 3" shell | | 3.318 | 2.699 | 0.619 | 0.400 | 0.940 | 0.076 | 0.501 | | 26,890 | Fine granular, light gray | 7.1058 |
| 5713 | do | | | | | | | | | | 22,000 | Granular, gray | 7.1648 |
| 5714 | do | | | | | | | | | | 25,990 | Fine granular, light gray | 7.2170 |
| 5726 | do | | | | | | | | | | 23,210 | Granular, gray | 7.1465 |
| 5729 | do | | | | | | | | | | 25,300 | do | 7.1760 |
| 5731 | do | | | | | | | | | | 22,020 | Granular, gray, spongy side | 7.1800 |
| 5732 | do | | | | | | | | | | 27,300 | Fine granular, gray | 7.1866 |
| 5733 | do | | | | | | | | | | 22,410 | do | 7.1126 |
| 5734 | do | | | | | | | | | | 29,210 | do | 7.1670 |
| 5738 | do | | | | | | | | | | 22,410 | do | 7.2085 |
| 5739 | do | | | | | | | | | | 24,520 | do | 7.0815 |

## Chemical Analyses and Tension Tests—Continued.

| No. of test. | Description. | Date of cast. | Chemical composition. | | | | | | | | Tensile strength per square inch. | Fracture. | Specific gravity. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Carbon. | | | Manganese. | Silicon. | Sulphur. | Phosphorus. | Copper. | | | |
| | | | Total. | Graphitic. | Combined. | | | | | | | | |
| | | | | | | | | | | | *Pounds.* | | |
| 5741 | 3" shell | | 2.808 | 2.279 | 0.529 | 0.388 | 1.880 | 0.110 | 0.403 | ..... | 27,080 | Fine granular, mottled | 7.1745 |
| 5742 | .....do | | | | | | | | | | 24,000 | Fine granular, light gray | 7.2111 |
| 5760 | .....do | | | | | | | | | | 30,450 | Granular, gray | 7.1855 |
| 5753 | .....do | | 3.070 | 2.405 | 0.665 | 0.375 | 2.162 | 0.110 | 0.403 | ..... | 27,960 | Granular, light gray | 7.1749 |
| 5754 | .....do | | | | | | | | | | 28,080 | .....do | 7.1681 |
| 5757 | .....do | | | | | | | | | | 27,200 | .....do | 7.2223 |
| 5758 | .....do | | | | | | | | | | 29,300 | Fine granular, light gray | 7.1714 |
| 5763 | .....do | | | | | | | | | | 28,400 | Fine granular, gray | 7.0968 |
| 5764 | .....do | | | | | | | | | | 29,200 | Fine granular, light gray | 7.2770 |
| 5765 | .....do | | | | | | | | | | 28,910 | .....do | 7.2254 |
| 5769 | .....do | | | | | | | | | | 26,740 | Fine granular, gray | 7.1640 |
| 5772 | .....do | | | | | | | | | | 27,500 | .....do | 7.1800 |
| 5778 | .....do | | | | | | | | | | 21,950 | Granular, gray | 7.1082 |
| 5779 | .....do | | | | | | | | | | 25,810 | .....do | 7.1429 |
| 5781 | .....do | | | | | | | | | | 28,490 | .....do | 7.2283 |
| 5783 | .....do | | | | | | | | | | 22,340 | .....do | 7.1945 |
| 5786 | .....do | | | | | | | | | | 25,420 | Granular, light gray | 7.1933 |
| 5802 | .....do | | | | | | | | | | 29,870 | Fine granular, light gray | 7.0804 |
| 5808 | .....do | | | | | | | | | | 27,720 | .....do | 7.1581 |
| 5804 | .....do | | | | | | | | | | 31,200 | .....do | 7.1359 |
| 5819 | .....do | | | | | | | | | | 29,990 | Fine granular, gray | 7.2110 |
| 5755 | 6" shell | | | | | | | | | | 26,520 | Granular, gray | 7.1383 |
| 5760 | .....do | | | | | | | | | | 31,980 | Fine granular, gray | 7.1651 |
| 5762 | .....do | | | | | | | | | | 27,020 | .....do | 7.1677 |
| 5766 | .....do | | | | | | | | | | 30,180 | Fine granular, light gray, mottled | 7.2902 |
| 5770 | .....do | | | | | | | | | | 30,610 | Fine granular, gray | 7.1520 |
| 5771 | .....do | | | | | | | | | | 36,550 | Fine granular, light gray, mottled | 7.2750 |
| 5782 | .....do | | | | | | | | | | 29,010 | Granular, gray | 7.2207 |
| 5805 | 8", 10", and 12" shot | | | | | | | | | | 24,520 | Fine granular, gray, mottled | 7.1137 |
| 5810 | .....do | | | | | | | | | | 25,300 | Fine granular, gray | 7.2518 |
| 5826 | .....do | | | | | | | | | | 27,900 | Fine granular, light gray, mottled | 7.3446 |
| 5827 | .....do | | | | | | | | | | 26,980 | Fine granular, dark gray | 7.1090 |
| 5833 | .....do | | | | | | | | | | 28,900 | Fine granular, mottled | 7.2360 |
| 5834 | .....do | | | | | | | | | | 26,850 | Fine granular, light gray | 7.2074 |
| 5838 | .....do | | | | | | | | | | 26,820 | Fine granular, light gray, mottled | 7.0332 |
| 5841 | .....do | | | | | | | | | | 27,200 | Fine granular, light gray | 7.1837 |
| 5842 | .....do | | | | | | | | | | 31,280 | .....do | 7.2339 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5848 | do | | | | | | | | | | 27,150 | Granular, gray | 7.0873 |
| 5852 | do | | | | | | | | | | 27,570 | do | 7.1223 |
| 5857 | do | | | | | | | | | | 27,410 | do | 7.1849 |
| 5859 | do | | | | | | | | | | 26,420 | do | 7.0933 |
| 5863 | 8", 10", 12" shot and 12" shell | | | | | | | | | | 28,460 | do | 7.1381 |
| 5865 | do | | | | | | | | | | 24,380 | do | 7.0639 |
| 5873 | 8", 10", 12" shot and shell | | | | | | | | | | 28,120 | do | 7.1207 |
| 5874 | do | | | | | | | | | | 27,400 | do | 7.1456 |
| 5875 | do | | | | | | | | | | 26,540 | do | 7.0621 |
| 5876 | do | | | | | | | | | | 25,100 | do | 7.1039 |
| 5877 | do | | | | | | | | | | 26,740 | do | 7.1409 |
| 5879 | do | | | | | | | | | | 26,660 | do | 7.1436 |
| 5883 | do | | | | | | | | | | 31,040 | Fine granular, light gray | 7.2148 |
| 5887 | do | | | | | | | | | | 26,420 | Granular, gray | 7.1095 |
| 5902 | do | | | | | | | | | | 24,050 | Medium coarse granular, mottled | 7.0929 |
| 5903 | do | | | | | | | | | | 22,800 | Medium coarse granular, dark gray | 7.1240 |
| 5904 | do | | | | | | | | | | 27,250 | Granular, gray | 7.1941 |
| 5906 | do | | | | | | | | | | 26,890 | Granular, mottled | 7.1345 |
| 5909 | do | | | | | | | | | | 26,320 | Granular, gray | 7.0743 |
| 5910 | do | | | | | | | | | | 25,490 | do | 7.0493 |
| 5911 | do | | | | | | | | | | 26,120 | Granular, dark gray | 7.1158 |
| 5912 | do | | | | | | | | | | 30,650 | Fine granular, light gray | 7.1297 |
| 5913 | do | | | | | | | | | | 29,170 | do | 7.2279 |
| 5917 | do | | | | | | | | | | 29,240 | Fine granular, light gray, mottled | 7.3399 |
| 5918 | do | | | | | | | | | | 28,060 | do | 7.3026 |
| 5919 | do | | | | | | | | | | 26,020 | Fine granular, gray | 7.3046 |
| 5921 | do | | | | | | | | | | 27,790 | Fine granular, light gray, mottled | 7.1133 |
| 5922 | do | | | | | | | | | | 29,240 | do | 7.1864 |
| 5923 | 10" and 12" shot and shell | | | | | | | | | | 29,200 | do | 7.3101 |
| 5924 | do | | | | | | | | | | 27,980 | do | 7.0885 |
| 5926 | do | | | | | | | | | | 31,970 | Fine granular, light gray, mottled | 7.2201 |
| | | 1899. | | | | | | | | | | | |
| 5929 | 12" shot and shell | Feb. 25 | | | | | | | | | 34,820 | Fine granular, light gray | 7.1685 |
| 5930 | do | Feb. 25 | | | | | | | | | 35,100 | do | 7.2901 |
| 5936 | do | Feb. 21 | 2.563 | 1.935 | 0.628 | 0.250 | 1.170 | 0.085 | 0.440 | | 34,700 | do | 7.2578 |
| 5937 | do | Mar. 1 | | | | | | | | | 27,740 | Fine granular, light gray, mottled | 7.1317 |
| 5939 | do | Mar. 9 | | | | | | | | | 35,300 | Fine granular, light gray | 7.2614 |
| 5940 | do | Mar. 11 | | | | | | | | | 29,910 | do | 7.1295 |
| 5941 | do | Mar. 14 | | | | | | | | | 28,200 | do | 7.2398 |
| 5943 | do | Mar. 16 | | | | | | | | | 31,520 | Fine granular, light gray, mottled | 7.1805 |
| 5944 | do | Mar. 3 | 3.212 | 2.836 | 0.376 | 0.475 | 1.144 | 0.155 | 0.374 | | 27,720 | Granular, mottled | 7.1808 |
| 5945 | do | Mar. 21 | | | | | | | | | 30,980 | do | 7.2873 |
| 5946 | do | Mar. 25 | | | | | | | | | 32,600 | Granular, gray | 7.1737 |
| 5947 | do | Mar. 29 | | | | | | | | | 30,400 | do | 7.1474 |
| 5948 | do | Apr. 3 | | | | | | | | | 28,900 | Fine granular, light gray, mottled | 7.1621 |
| 5951 | 12" shot | Apr. 15 | | | | | | | | | 27,100 | Fine granular, gray | 7.1401 |
| 5953 | 12" shot and shell | Apr. 18 | | | | | | | | | 34,900 | Fine granular, light gray | 7.3148 |
| 5955 | 12" shell | Apr. 22 | | | | | | | | | 31,400 | do | 7.2197 |
| 5957 | 12" shot and shell | May 5 | | | | | | | | | 31,040 | do | 7.1741 |
| 5958 | do | May 8 | | | | | | | | | 31,400 | do | 7.1956 |
| 5959 | do | May 15 | | | | | | | | | 31,800 | do | 7.1874 |
| 5964 | do | May 19 | | | | | | | | | 30,020 | Fine granular, light gray, mottled | 6.9253 |
| 5965 | do | May 23 | | | | | | | | | 27,300 | do | 7.3239 |

## CHEMICAL ANALYSES AND TENSION TESTS—Continued.

| No. of test. | Description. | Date of cast. | Chemical composition. | | | | | | | | Tensile strength per square inch. | Fracture. | Specific gravity. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Carbon. | | | Manganese. | Silicon. | Sulphur. | Phosphorus. | Copper. | | | |
| | | | Total. | Graphitic. | Combined. | | | | | | | | |
| | | | | | | | | | | | *Pounds.* | | |
| 5966 | 12" shot and shell | May 27 | | | | | | | | | 31,100 | Fine granular, light gray | 7.1519 |
| 5969 | do | June 2 | 3.304 | 2.186 | 1.118 | 0.252 | 1.850 | 0.070 | 0.782 | | 33,600 | Fine granular, gray, mottled | 7.2562 |
| 5971 | do | June 8 | | | | | | | | | 24,300 | Fine granular, light gray | 7.2423 |
| 5980 | do | June 14 | | | | | | | | | 30,860 | do | 7.1366 |
| 5981 | do | June 17 | | | | | | | | | 28,340 | Fine granular, gray, mottled | 7.1143 |
| 5982 | do | June 22 | | | | | | | | | 29,030 | Fine granular, light gray | 7.1587 |
| 5986 | do | June 26 | | | | | | | | | 32,100 | Fine granular, gray, mottled | 7.1315 |
| 5691 | Side frame 12" disappearing carriage. | | | | | | | | | | 35,500 | Granular, light gray | 7.2330 |
| 5709 | do | | | | | | | | | | 34,020 | Granular, gray | 7.2558 |
| 5725 | do | | | | | | | | | | 33,040 | Fine granular, gray | 7.1447 |
| 5761 | do | | | | | | | | | | 36,700 | do | 7.2319 |
| 5768 | do | | | | | | | | | | 35,400 | Fine granular, light gray | 7.2747 |
| 5867 | do | | | | | | | | | | 32,200 | Fine granular, gray | 7.1616 |
| 5926 | do | | | | | | | | | | 31,970 | Fine granular, light gray, mottled | 7.2201 |
| 5856 | do | | | | | | | | | | 33,750 | Granular, gray | 7.1821 |
| 5759 | Lower roller path 12-inch disappearing carriage. | | | | | | | | | | 34,960 | Fine granular, light gray | 7.2584 |
| 5837 | do | | | | | | | | | | 28,060 | Fine granular, dark gray | 7.1579 |
| 5915 | do | | | | | | | | | | 29,990 | Granular, gray | 7.1025 |
| 5916 | do | | | | | | | | | | 27,410 | Fine granular, dark gray | 7.1787 |
| 5697 | 10-inch top disappearing carriage. | | | | | | | | | | 34,050 | Granular, gray | 7.2269 |
| 5724 | do | | | | | | | | | | 36,180 | do | 7.2162 |
| 5735 | do | | | | | | | | | | 36,300 | Fine granular, gray | 7.1517 |
| 5780 | do | | | | | | | | | | 30,300 | Granular, gray | 7.2157 |
| 5811 | do | | | | | | | | | | 32,680 | Fine granular, dark gray | |
| 5846 | do | | | | | | | | | | 23,590 | Granular, mottled, light gray | 7.1968 |
| 5851 | do | | | | | | | | | | 33,020 | Fine granular, light gray | 7.1381 |
| 5945 | do | Mar. 21 | | | | | | | | | 30,980 | Granular, mottled | 7.2873 |
| 5940 | 10-inch platform plate | Mar. 11 | | | | | | | | | 29,910 | Fine granular, light gray | 7.1295 |
| 5955 | do | Apr. 22 | | | | | | | | | 31,400 | do | 7.2197 |
| 5767 | Chassis, 8-inch barbette carriage. | | | | | | | | | | 33,510 | Fine granular, light gray | 7.1515 |
| 5880 | 6-inch disappearing carriage | | | | | | | | | | 30,980 | Granular, light gray | 7.1079 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5890 | .....do | | | | | | | | | | 30,650 | Fine granular, light gray | 7.1445 |
| 5899 | .....do | | | | | | | | | | 32,850 | Fine granular, gray | 7.1633 |
| 5906 | .....do | | | | | | | | | | 32,400 | Fine granular, light gray | 7.3096 |
| 5923 | .....do | | | | | | | | | | 29,200 | Fine granular, light gray, mottled | 7.3101 |
| 5929 | .....do | | | | | | | | | | 34,820 | Fine granular, light gray | 7.1685 |
| 5930 | .....do | Feb. 25 | | | | | | | | | 35,100 | .....do | 7.2901 |
| 5934 | .....do | Mar. 7 | 2.686 | 2.203 | 0.483 | 0.386 | 1.220 | 0.080 | 0.529 | | 34,550 | .....do | 7.2051 |
| 5945 | .....do | Mar. 21 | | | | | | | | | 30,980 | Granular, mottled | 7.2873 |
| 5946 | .....do | Mar. 25 | | | | | | | | | 32,600 | Granular, gray | 7.1737 |
| 5947 | .....do | Mar. 29 | | | | | | | | | 30,400 | .....do | 7.1474 |
| 5948 | .....do | Apr. 3 | | | | | | | | | 28,900 | Fine granular, light gray, mottled | ..... |
| 5955 | .....do | Apr. 22 | | | | | | | | | 31,400 | Fine granular, light gray | 7.2197 |
| 5956 | .....do | Apr. 27 | | | | | | | | | 29,860 | .....do | 7.0304 |
| 5957 | .....do | May 5 | | | | | | | | | 31,040 | .....do | ..... |
| 5958 | .....do | May 8 | | | | | | | | | 31,400 | .....do | ..... |
| 5959 | .....do | May 15 | | | | | | | | | 31,800 | .....do | ..... |
| 5964 | .....do | May 19 | | | | | | | | | 30,020 | Fine granular, light gray, mottled | 6.9253 |
| 5965 | .....do | May 23 | | | | | | | | | 27,300 | .....do | 7.3239 |
| 5966 | .....do | May 27 | | | | | | | | | 31,100 | Fine granular, light gray | 7.1519 |
| 5969 | .....do | June 2 | 3.304 | 2.186 | 1.118 | 0.252 | 1.850 | 0.070 | 0.782 | | 33,600 | Fine granular, gray, mottled | 7.2562 |
| 5971 | .....do | June 8 | | | | | | | | | 24,300 | Fine granular, light gray | 7.2423 |
| 5980 | .....do | June 14 | | | | | | | | | 30,860 | .....do | 7.1366 |
| 5981 | .....do | June 17 | | | | | | | | | 28,340 | Fine granular, gray, mottled | 7.1143 |
| 5982 | .....do | June 22 | | | | | | | | | 29,030 | Fine granular, light gray | ..... |
| 5986 | .....do | June 26 | | | | | | | | | 32,100 | Fine granular, gray, mottled | ..... |
| 5703 | 5-inch R. F. gun carriage | | | | | | | | | | 35,460 | Fine granular, light gray | 7.2584 |
| 5980 | 12-inch mortar top carriage | June 14 | | | | | | | | | 30,860 | .....do | 7.1366 |
| 5982 | .....do | June 22 | | | | | | | | | 29,030 | .....do | ..... |

## CHEMICAL ANALYSES AND TENSION TESTS—Continued.

PIG IRONS.

| No. of test. | Description. | Chemical composition. | | | | | | | | Tensile strength per square inch. | Fracture. | Specific gravity. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Carbon. | | | Manganese. | Silicon. | Sulphur. | Phosphorus. | Copper. | | | |
| | | Total. | Graphitic. | Combined. | | | | | | | | |
| | | | | | | | | | | *Pounds.* | | |
| 5816 | Niagara malleable pig iron, No. 2 | 4.150 | 3.370 | 0.780 | 0.420 | 1.513 | 0.068 | 0.114 | ..... | 25,260 | Granular, with brilliant facets | ..... |
| 5817 | Niagara malleable pig iron, No. 3 | 4.025 | 3.272 | 0.753 | 0.451 | 0.850 | 0.131 | 0.105 | ..... | 14,210 | Granular, varying in size, with brilliant facets. | ..... |
| 5818 | Niagara malleable pig iron, No. 7 | 4.183 | 3.468 | 0.715 | 0.356 | 0.800 | 0.050 | 0.130 | ..... | 15,490 | Granular, with brilliant facets | ..... |
| 5861 | Salisbury pig, No. 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 30,760 | Fine and medium granulation interspersed, gray. | 7.1738 |
| 5871 | Salisbury carbonate pig | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 16,250 | Medium fine granular, brilliant facets, gray. | 7.0136 |
| 5882 | .....do..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 37,300 | Fine granular, gray | 7.2395 |
| 5927 | Muirkirk pig | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 33,250 | Fine granular, dark gray | 7.1629 |
| 5928 | .....do..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 28,100 | .....do..... | 6.5215 |
| 5869 | Lake Superior pig | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,200 | Coarse and fine granulation, brilliant facets, gray. | 7.0260 |
| 5870 | Lake Superior pig (charcoal) | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 32,400 | Fine granular, gray | 7.2160 |
| 5881 | Lake Superior pig, No. 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 14,310 | Medium and fine granulation interspersed. | 7.1394 |
| 5942 | Rebecca soft pig, No. 1 | 3.580 | 3.406 | 0.174 | 0.310 | 3.110 | 0.046 | 0.487 | ..... | 12,300 | Medium and fine granulation interspersed, bright facets. | 6.8982 |
| 5884 | Vulcan pig, No. 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 17,600 | Coarse and fine granulation interspersed, brilliant facets. | 6.9252 |
| 5970 | Clifton pig, No. 1 | 3.206 | 3.176 | 0.030 | 1.200 | 3.400 | 0.020 | 0.619 | ..... | 12,900 | .....do..... | 6.9030 |

## *CAST IRON FURNISHED BY PRIVATE PARTIES FOR ORDNANCE MATERIAL.*

TENSION TESTS.

| No. of test. | Description. | Marks. | Tensile strength per square inch. | Fracture. |
|---|---|---|---|---|
| | | | *Pounds.* | |
| 5698 | 3″.2 shell | 8 | 26,340 | Fine granular, gray. |
| 5699 | .....do | 9 | 29,100 | Do. |
| 5700 | .....do | 10 | 29,340 | Do. |
| 5701 | .....do | 13 | 24,580 | Do. |
| 5702 | .....do | 14 | 28,050 | Do. |
| 5715 | .....do | 12 | 28,200 | Do. |
| 5716 | .....do | 15 | 26,990 | Do. |
| 5717 | .....do | 16 | 28,020 | Do. |
| 5718 | .....do | 21 | 26,980 | Do. |
| 5719 | .....do | 23 | 29,350 | Do. |
| 5720 | 10″ limited fire disappearing carriage. | 17 | 31,010 | Do. |
| 5721 | .....do | 16 | 29,900 | Do. |
| 5722 | 10″ all round fire disappearing carriage. | 18 | 30,580 | Fine granular, light gray. |
| 5727 | .....do | 19 | 29,710 | Granular, gray. |
| 5728 | .....do | 20 | 29,920 | Do. |
| 5736 | .....do | 21 | 29,420 | Fine granular, gray. |
| 5737 | .....do | 22 | 30,200 | Do. |
| 5949 | .....do | ..... | 28,500 | Do. |
| 5751 | .....do | 23 | 28,380 | Granular, gray. |
| 5752 | .....do | 24 | 31,020 | Do. |
| 5756 | .....do | 25 | 31,900 | Granular, light gray. |
| 5801 | .....do | 28 | 31,990 | Fine granular, light gray. |
| 5743 | 3″.2 shell | 24 | 27,800 | Granular, gray. |
| 5744 | .....do | 25 | 27,710 | Do. |
| 5745 | .....do | 26 | 28,180 | Do. |
| 5746 | .....do | 27 | 27,300 | Do. |
| 5747 | .....do | 28 | 27,870 | Do. |
| 5748 | .....do | 29 | 26,460 | Do. |
| 5773 | .....do | 30 | 28,970 | Fine granular, gray. |
| 5774 | .....do | 31 | 28,570 | Do. |
| 5775 | .....do | 32 | 29,450 | Do. |
| 5776 | .....do | 33 | 29,990 | Do. |
| 5777 | .....do | 34 | 27,610 | Do. |
| 5784 | 7″ shell and 10″ shot | 7-1-25 | 25,900 | Granular, gray. |
| 5785 | .....do | 7-2-25 | 23,100 | Granular, with coarse spangles, gray. |
| 5787 | .....do | R 7-41 | 26,080 | Fine granular, gray. |
| 5788 | .....do | R 7-48 | 25,670 | Do. |
| 5789 | .....do | R 7-61 | 27,610 | Do. |
| 5790 | .....do | R 7-62 | 29,740 | Fine granular, gray, mottled. |
| 5791 | .....do | R 7-63 | 25,930 | Fine granular, gray. |
| 5792 | .....do | R 10-59 | 28,910 | Fine granular, light gray, mottled. |
| 5793 | .....do | R 10-60 | 28,610 | Do. |
| 5794 | .....do | R 10-61 | 30,220 | Do. |
| 5795 | .....do | R 10-62 | 30,600 | Do. |
| 5796 | .....do | R 10-63 | 27,860 | Do. |
| 5797 | .....do | R 7-64 | 28,220 | Fine granular, light gray. |
| 5798 | .....do | R 10-64 | 30,210 | Fine granular, light gray, mottled. |
| 5799 | .....do | R 10-65 | 26,300 | Do. |
| 5800 | .....do | R 10-66 | 26,590 | Do. |
| 5806 | .....do | R 7-65 | 26,890 | Fine granular, dark gray. |
| 5807 | .....do | R 7-66 | 25,720 | Do. |
| 5808 | .....do | R 10-67 | 29,980 | Fine granular, light gray, mottled. |
| 5809 | .....do | R 10-68 | 28,300 | Do. |
| 5812 | .....do | R 7-67 | 24,420 | Fine granular, gray. |
| 5813 | .....do | R 7-68 | 27,060 | Fine granular, light gray. |
| 5814 | .....do | R 7-69 | 28,410 | Fine granular, gray. |
| 5815 | .....do | R 10-69 | 28,900 | Fine granular, mottled. |
| 5822 | .....do | R 7-70 | 27,490 | Fine granular, gray. |
| 5823 | .....do | R 7-71 | 28,970 | Do. |
| 5824 | .....do | R 10-70 | 29,860 | Fine granular, mottled. |
| 5825 | .....do | R 10-71 | 28,620 | Do. |
| 5828 | .....do | R 10-65 D | 24,710 | Fine granular, light gray, mottled. |
| 5829 | .....do | R 10-66 D | 26,980 | Do. |
| 5830 | .....do | R 7-67 D | 25,210 | Fine granular, dark gray. |
| 5831 | .....do | R 7-71 D | 24,060 | Fine granular, gray. |
| 5835 | 10″ shot | R 10-79 D | 28,520 | Fine granular, mottled. |
| 5848 | Top carriage casting | T C C 123-1 | 27,980 | Fine granular, light gray. |
| 5849 | .....do | T C C 123-2 | 26,510 | Do. |
| 5850 | .....do | T C C 123-3 | 26,620 | Do. |
| 5854 | Racer for gun carriage. | R 118<br>1 T 4-1 | 27,960 | Fine granular, light gray. |

*CAST IRON FURNISHED BY PRIVATE PARTIES FOR ORDNANCE MATERIAL*—Continued.

TENSION TESTS—Continued.

| No. of test. | Description. | Marks. | Tensile strength per square inch. | Fracture. |
|---|---|---|---|---|
| | | | *Pounds.* | |
| 5920 | 4" shell | Lot No. 1 | 15,800 | Fine granular, dark gray. |
| 5925 | .....do | ..... | 18,900 | Varies from fine to medium granular, dark gray. |
| 5950 | 15-pounder common shell. | C L 1 | 21,050 | Fine granular, dark gray. |
| 5954 | .....do | C L 2 | 24,850 | Do. |
| 5961 | .....do | C L 3 | 23,200 | Fine granular, gray. |
| 5962 | .....do | C L 4 | 24,350 | Do. |
| 5963 | .....do | C L 5 | 18,300 | Do. |
| 5967 | .....do | C L 7 | 22,050 | Do. |
| 5968 | .....do | C L 8 | 23,550 | Do. |
| 5977 | .....do | C L 9 | 24,400 | Do. |
| 5978 | .....do | C L 10 | 23,050 | Do. |
| 5979 | .....do | C L 11 | 26,550 | Do. |
| 5984 | .....do | C L 12 | 26,050 | Fine granular, dark gray. |
| 5985 | .....do | C L 13 | 26,550 | Do. |
| 5976 | 6-pounder common shell. | C L 1 | 21,600 | Fine granular, gray. |
| 5983 | .....do | 2 C L 1 | 22,350 | Fine granular, dark gray. |

# STEEL

FOR

# STANDARDIZING TESTING MACHINES.

## SPECIMENS FROM AN ANNEALED BAR OF STEEL FOR STANDARDIZING TESTING MACHINE AT THE WORKS OF THE BENJAMIN ATHA AND ILLINGWORTH COMPANY, HARRISON, N. J.

### No. 6001.

Marks, 1 W.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000300 | ..... | ..... | |
| 9,000 | 45,000 | .001500 | .000200 | ..... | ..... | |
| 10,000 | 50,000 | .001650 | .000150 | ..... | ..... | |
| 11,000 | 55,000 | .001850 | .000200 | ..... | ..... | |
| 12,000 | 60,000 | .002050 | .000200 | ..... | ..... | |
| 13,000 | 65,000 | .002250 | .000200 | ..... | ..... | |
| 13,200 | 66,000 | .002300 | .000050 | ..... | ..... | |
| 13,400 | 67,000 | .002350 | .000050 | ..... | ..... | Elastic limit, Load fell. |
| 12,400 | 62,000 | .003650 | .001300 | ..... | ..... | |
| 12,600 | 63,000 | .005600 | .001950 | ..... | ..... | |
| 12,800 | 64,000 | .009000 | .003400 | ..... | ..... | |
| 13,000 | 65,000 | .012250 | .003250 | ..... | ..... | |
| 13,200 | 66,000 | .013650 | .001400 | ..... | ..... | |
| 13,600 | 68,000 | .016100 | .002450 | ..... | ..... | |
| 14,000 | 70,000 | .019000 | .002900 | ..... | ..... | |
| 14,800 | 74,000 | .025000 | .006000 | ..... | ..... | |
| 15,600 | 78,000 | .033000 | .008000 | ..... | ..... | |
| 16,400 | 82,000 | .043600 | .010600 | ..... | ..... | |
| 17,200 | 86,000 | .0600 | .0164 | ..... | ..... | |
| 18,000 | 90,000 | .1100 | .0500 | ..... | ..... | |
| 18,040 | 90,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,200 |
| Elastic limit per square inch of original section | do... | 67,000 |
| Elongation per inch after rupture | inch.. | .2650 |
| Elongation per inch under strain at elastic limit | do... | .002350 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture per cent of original section | | 57.2 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | fine silky, cup shaped, serrated |
| Elongation of inch sections | | ".32*, ".21 |

## No. 6002.

Marks, 3 W.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | ..... | ..... | |
| 10,000 | 50,000 | .001800 | .000400 | ..... | ..... | |
| 11,000 | 55,000 | .001950 | .000150 | ..... | ..... | |
| 12,000 | 60,000 | .002050 | .000100 | ..... | ..... | |
| 12,200 | 61,000 | .002100 | .000050 | ..... | ..... | |
| 12,400 | 62,000 | .002150 | .000050 | ..... | ..... | |
| 12,600 | 63,000 | .002200 | .000050 | ..... | ..... | Elastic limit. |
| 12,800 | 64,000 | .002350 | .000150 | ..... | ..... | |
| | | | | | | Load fell. |
| 12,200 | 61,000 | .003400 | .001050 | ..... | ..... | |
| 12,400 | 62,000 | .004500 | .001100 | ..... | ..... | |
| 12,600 | 63,000 | .008250 | .003750 | ..... | ..... | |
| 12,800 | 64,000 | .013250 | .005000 | ..... | ..... | |
| 13,000 | 65,000 | .014300 | .001050 | ..... | ..... | |
| 13,200 | 66,000 | .015600 | .001300 | ..... | ..... | |
| 13,600 | 68,000 | .018450 | .002850 | ..... | ..... | |
| 14,000 | 70,000 | .021500 | .003050 | ..... | ..... | |
| 14,800 | 74,000 | .027750 | .006250 | ..... | ..... | |
| 15,600 | 78,000 | .035750 | .008000 | ..... | ..... | |
| 16,400 | 82,000 | .049500 | .013750 | ..... | ..... | |
| 17,200 | 86,000 | .0700 | .0205 | ..... | ..... | |
| 17,960 | 89,800 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,800 |
| Elastic limit per square inch of original section | do... | 63,000 |
| Elongation per inch after rupture | inch.. | .2650 |
| Elongation per inch under strain at elastic limit | do... | .002200 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | fine silky, cup shaped, serrated |
| Elongation of inch sections | | ".14, ".39 |

## No. 6003.

Marks, 5 W.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | 0. | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | ..... | ..... | |
| 10,000 | 50,000 | .001650 | .000300 | ..... | ..... | |
| 11,000 | 55,000 | .001850 | .000200 | ..... | ..... | |
| 12,000 | 60,000 | .002050 | .000200 | ..... | ..... | |
| 12,200 | 61,000 | .002050 | 0. | ..... | ..... | |
| 12,400 | 62,000 | .002100 | .000050 | ..... | ..... | |
| 12,600 | 63,000 | .002150 | .000050 | ..... | ..... | |
| 12,800 | 64,000 | .002150 | 0. | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 12,200 | 61,000 | .004400 | .002250 | ..... | ..... | |
| 12,400 | 62,000 | .006000 | .001600 | ..... | ..... | |
| 12,600 | 63,000 | .010000 | .004000 | ..... | ..... | |
| 12,800 | 64,000 | .012900 | .002900 | ..... | ..... | |
| 13,000 | 65,000 | .013950 | .001050 | ..... | ..... | |
| 13,200 | 66,000 | .015000 | .001050 | ..... | ..... | |
| 13,600 | 68,000 | .018050 | .003050 | ..... | ..... | |
| 14,000 | 70,000 | .022000 | .003950 | ..... | ..... | |
| 14,800 | 74,000 | .028500 | .006500 | ..... | ..... | |
| 15,600 | 78,000 | .038000 | .009500 | ..... | ..... | |
| 16,400 | 82,000 | .050000 | .012000 | ..... | ..... | |
| 17,200 | 86,000 | .0700 | .0200 | ..... | ..... | |
| 17,800 | 89,000 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 89,000 |
| Elastic limit per square inch of original section | do... | 64,000 |
| Elongation per inch after rupture | inch.. | .2850 |
| Elongation per inch under strain at elastic limit | do... | .002150 |
| Reduction in diameter at point of rupture | do... | .185 |
| Reduction in area after rupture, per cent of original section | | 59.8 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | fine silky, cup shaped, serrated |
| Elongation of inch sections | | ".22, ".35* |

## No. 6004.

Marks, 7 W.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | ..... | ..... | |
| 10,000 | 50,000 | .001800 | .000400 | ..... | ..... | |
| 11,000 | 55,000 | .001950 | .000150 | ..... | ..... | |
| 12,000 | 60,000 | .002100 | .000150 | ..... | ..... | |
| 12,200 | 61,000 | .002200 | .000100 | ..... | ..... | |
| 12,400 | 62,000 | .002250 | .000050 | ..... | ..... | Elastic limit. |
| 12,600 | 63,000 | .002400 | .000150 | ..... | ..... | |
| | | | | | | Load fell. |
| 12,000 | 60,000 | .006000 | .003600 | ..... | ..... | |
| 12,200 | 61,000 | .007500 | .001500 | ..... | ..... | |
| 12,400 | 62,000 | .011400 | .003900 | ..... | ..... | |
| 12,600 | 63,000 | .012100 | .000700 | ..... | ..... | |
| 12,800 | 64,000 | .013500 | .001400 | ..... | ..... | |
| 13,000 | 65,000 | .014150 | .000650 | ..... | ..... | |
| 13,200 | 66,000 | .015500 | .001350 | ..... | ..... | |
| 13,600 | 68,000 | .018100 | .002600 | ..... | ..... | |
| 14,000 | 70,000 | .021500 | .003400 | ..... | ..... | |
| 14,800 | 74,000 | .028100 | .006600 | ..... | ..... | |
| 15,600 | 78,000 | .035000 | .006900 | ..... | ..... | |
| 16,400 | 82,000 | .045000 | .010000 | ..... | ..... | |
| 17,200 | 86,000 | .0600 | .0150 | ..... | ..... | |
| 18,000 | 90,000 | .1000 | .0400 | ..... | ..... | |
| 18,120 | 90,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,600 |
| Elastic limit per square inch of original section | do... | 62,000 |
| Elongation per inch after rupture | inch.. | .2550 |
| Elongation per inch under strain at elastic limit | do... | .002250 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | ".6 from neck |
| Character of broken surface | | fine silky, cup shaped, serrated |
| Elongation of inch sections | | ".12, ".39 |

## No. 6005.

Marks, 9 W.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | 0. | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | ..... | ..... | |
| 10,000 | 50,000 | .001650 | .000350 | ..... | ..... | |
| 11,000 | 55,000 | .001800 | .000150 | ..... | ..... | |
| 12,000 | 60,000 | .001950 | .000150 | ..... | ..... | |
| 12,200 | 61,000 | .002000 | .000050 | ..... | ..... | |
| 12,320 | 61,600 | ..... | ..... | ..... | ..... | Elastic limit. Load fell. |
| 12,000 | 60,000 | .004700 | .002700 | ..... | ..... | |
| 12,200 | 61,000 | .007500 | .002800 | ..... | ..... | |
| 12,400 | 62,000 | .010250 | .002750 | ..... | ..... | |
| 12,600 | 63,000 | .011250 | .001000 | ..... | ..... | |
| 12,800 | 64,000 | .012650 | .001400 | ..... | ..... | |
| 13,000 | 65,000 | .013750 | .001100 | ..... | ..... | |
| 13,200 | 66,000 | .015000 | .001250 | ..... | ..... | |
| 13,600 | 68,000 | .017400 | .002400 | ..... | ..... | |
| 14,000 | 70,000 | .019500 | .002100 | ..... | ..... | |
| 14,800 | 74,000 | .026750 | .007250 | ..... | ..... | |
| 15,600 | 78,000 | .033600 | .006850 | ..... | ..... | |
| 16,400 | 82,000 | .042250 | .008650 | ..... | ..... | |
| 17,200 | 86,000 | .0550 | .012750 | ..... | ..... | |
| 18,000 | 90,000 | .0800 | .0250 | ..... | ..... | |
| 18,380 | 91,900 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,900 |
| Elastic limit per square inch of original section | do... | 61,600 |
| Elongation per inch after rupture | inch.. | .2600 |
| Reduction in diameter at point of rupture | do... | .175 |
| Reduction in area after rupture, per cent of original section | | 57.2 |
| Position of rupture | | 1″. from neck |
| Character of broken surface | | fine silky, cup shaped, serrated |
| Elongation of inch sections | | ″.15, ″.37* |

## Steel Specimens for Standardizing Testing Machine at Works of The Taylor Iron and Steel Company, High Bridge, N. J.

### No. 6024.

Marks, 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000450 | 0. | ..... | |
| 9,000 | 45,000 | .001650 | .000200 | ..... | ..... | |
| 9,200 | 46,000 | .001700 | .000050 | ..... | ..... | Elastic limit. |
| 9,400 | 47,000 | .001900 | .000200 | ..... | ..... | |
| | | .006250 | .004350 | ..... | ..... | |
| 9,600 | 48,000 | .007500 | .001250 | ..... | ..... | |
| 9,800 | 49,000 | .008150 | .000650 | ..... | ..... | |
| 10,000 | 50,000 | .008950 | .000800 | ..... | ..... | |
| 10,200 | 51,000 | .009900 | .000950 | ..... | ..... | |
| 18,720 | 93,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 93,600 |
| Elastic limit per square inch of original section | do... | 46,000 |
| Elongation per inch after rupture | inch.. | .2300 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".14, ".32* |

No. 6025.

Marks, 2.
Diameter ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000450 | 0. | ..... | |
| 9,000 | 45,000 | .001650 | .000200 | ..... | ..... | |
| 9,200 | 46,000 | .001700 | .000050 | ..... | ..... | |
| 9,400 | 47,000 | .001750 | .000050 | ..... | ..... | |
| 9,600 | 48,000 | .001850 | .000100 | ..... | ..... | Elastic limit. |
| 9,800 | 49,000 | .008500 | .006650 | ..... | ..... | |
| 10,000 | 50,000 | .009500 | .001000 | ..... | ..... | |
| 10,200 | 51,000 | .009900 | .000400 | ..... | ..... | |
| 10,400 | 52,000 | .010250 | .000350 | ..... | ..... | |
| 10,600 | 53,000 | .010550 | .000300 | ..... | ..... | |
| 18,820 | 94,100 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,100 |
| Elastic limit per square inch of original section | do... | 48,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001850 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".28*, ".20 |

No. 6026.

Marks, 3.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | 0. | ..... | |
| 9,000 | 45,000 | .001600 | .000200 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .006000 | .004400 | ..... | ..... | |
| 9,400 | 47,000 | .006750 | .000750 | ..... | ..... | |
| 9,600 | 48,000 | .007450 | .000700 | ..... | ..... | |
| 9,800 | 49,000 | .008150 | .000700 | ..... | ..... | |
| 10,000 | 50,000 | .009150 | .001000 | ..... | ..... | |
| 18,650 | 93,250 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 93,250 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2400 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | 1".1 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".26*, ".22 |

## No. 6027.

Marks, 4.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000400 | 0. | ..... | |
| 8,600 | 43,000 | .001700 | .000250 | ..... | ..... | |
| 8,800 | 44,000 | .001850 | .000150 | ..... | ..... | |
| 9,000 | 45,000 | .001900 | .000050 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .006750 | .004850 | ..... | ..... | |
| 9,400 | 47,000 | .007100 | .000350 | ..... | ..... | |
| 9,600 | 48,000 | .007900 | .000800 | ..... | ..... | |
| 9,800 | 49,000 | .008650 | .000750 | ..... | ..... | |
| 10,000 | 50,000 | .009500 | .000850 | ..... | ..... | |
| 18,490 | 92,450 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,450 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2450 |
| Elongation per inch under strain at elastic limit | do... | .001900 |
| Reduction in diameter at point of rupture | do... | .105 |
| Reduction in area after rupture, per cent of original section | | 37.1 |
| Position of rupture | | 1".2 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".28, ".21 |

## No. 6028.

Marks, 5.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | ..... | ..... | |
| 7,600 | 38,000 | .001400 | .000350 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001800 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .002400 | .000600 | ..... | ..... | |
| 8,200 | 41,000 | .003900 | .001500 | ..... | ..... | |
| 8,400 | 42,000 | .004550 | .000650 | ..... | ..... | |
| 8,600 | 43,000 | .005400 | .000850 | ..... | ..... | |
| 8,800 | 44,000 | .006050 | .000650 | ..... | ..... | |
| 17,830 | 89,150 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds | 89,150 |
| Elastic limit per square inch of original section | do | 38,000 |
| Elongation per inch after rupture | inch | .250 |
| Elongation per inch under strain at elastic limit | do | .001400 |
| Reduction in diameter at point of rupture | do | .115 |
| Reduction in area after rupture, per cent of original section | | 10.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".24", ".11 |

## No. 6029.

Marks, 6.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | ..... | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001400 | .000400 | ..... | ..... | |
| 9,200 | 46,000 | .001650 | .000250 | ..... | ..... | |
| 9,400 | 47,000 | .001750 | .000100 | ..... | ..... | Elastic limit. |
| 9,600 | 48,000 | .008500 | .006750 | ..... | ..... | |
| 9,800 | 49,000 | .009500 | .001000 | ..... | ..... | |
| 10,000 | 50,000 | .010050 | .000550 | ..... | ..... | |
| 10,200 | 51,000 | .010750 | .000700 | ..... | ..... | |
| 10,400 | 52,000 | .011750 | .001000 | ..... | ..... | |
| 18,300 | 91,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 91,500 |
| Elastic limit per square inch of original section | do... | 47,000 |
| Elongation per inch after rupture | inch.. | .2600 |
| Elongation per inch under strain at elastic limit | do.... | .001750 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".28*, ".24* |

## No. 6030.

Marks, 7.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 7,600 | 38,000 | .001400 | .000400 | ..... | ..... | Elastic limit. |
| 7,800 | 39,000 | .001700 | .000300 | ..... | ..... | |
| 8,000 | 40,000 | .003650 | .001950 | ..... | ..... | |
| 8,200 | 41,000 | .005500 | .001850 | ..... | ..... | |
| 8,400 | 42,000 | .006400 | .000900 | ..... | ..... | |
| 8,600 | 43,000 | .007000 | .000600 | ..... | ..... | |
| 8,800 | 44,000 | .008100 | .001100 | ..... | ..... | |
| 17,320 | 86,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 86,600 |
| Elastic limit per square inch of original section | do... | 38,000 |
| Elongation per inch after rupture | inch.. | .2500 |
| Elongation per inch under strain at elastic limit | do... | .001400 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".27*, ".23* |

## No. 6031.

Marks, 8.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000150 | .000150 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000700 | .000350 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000300 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000450 | 0. | ..... | |
| 9,000 | 45,000 | .001750 | .000300 | ..... | ..... | Elastic limit. |
| 9,200 | 46,000 | .001900 | .000150 | ..... | ..... | |
| 9,400 | 47,000 | .007750 | .005850 | ..... | ..... | |
| 9,600 | 48,000 | .008500 | .000750 | ..... | ..... | |
| 9,800 | 49,000 | .009100 | .000600 | ..... | ..... | |
| 10,000 | 50,000 | .009900 | .000800 | ..... | ..... | |
| 18,460 | 92,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,300 |
| Elastic limit per square inch of original section | do... | 45,000 |
| Elongation per inch after rupture | inch.. | .2350 |
| Elongation per inch under strain at elastic limit | do... | .001750 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".16, ".31* |

## No. 6032.

Marks, 9.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000800 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001450 | .000450 | .000050 | .000050 | |
| 8,200 | 41,000 | .001500 | .000050 | ..... | ..... | |
| 8,400 | 42,000 | .001550 | .000050 | ..... | ..... | |
| 8,600 | 43,000 | .001650 | .000100 | ..... | ..... | Elastic limit. |
| 8,800 | 44,000 | .001800 | .000150 | ..... | ..... | |
| 9,000 | 45,000 | .004250 | .002450 | ..... | ..... | |
| 9,200 | 46,000 | .005900 | .001650 | ..... | ..... | |
| 9,400 | 47,000 | .006500 | .000600 | ..... | ..... | |
| 9,600 | 48,000 | .007500 | .001000 | ..... | ..... | |
| 18,810 | 94,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 94,050 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .2250 |
| Elongation per inch under strain at elastic limit | do... | .001650 |
| Reduction in diameter at point of rupture | do... | .115 |
| Reduction in area after rupture, per cent of original section | | 40.3 |
| Position of rupture | | ".75 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".30", ".15 |

## No. 6033.

Marks, 10.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .001350 | .000350 | 0. | ..... | |
| 10,000 | 50,000 | .001650 | .000300 | ..... | ..... | |
| 10,200 | 51,000 | .001700 | .000050 | ..... | ..... | Elastic limit. |
| 10,400 | 52,000 | .011250 | .009550 | ..... | ..... | |
| 10,600 | 53,000 | .011650 | .000400 | ..... | ..... | |
| 10,800 | 54,000 | .012100 | .000450 | ..... | ..... | |
| 11,000 | 55,000 | .013000 | .000900 | ..... | ..... | |
| 11,200 | 56,000 | .014250 | .001250 | ..... | ..... | |
| 18,540 | 92,700 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 92,700 |
| Elastic limit per square inch of original section | do... | 51,000 |
| Elongation per inch after rupture | inch.. | .2500 |
| Elongation per inch under strain at elastic limit | do... | .001700 |
| Reduction in diameter at point of rupture | do... | .125 |
| Reduction in area after rupture, per cent of original section | | 43.3 |
| Position of rupture | | 1" from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ".30*,".20 |

## TABULATION OF TENSION TESTS OF STEEL SPECIMENS FOR STANDARDIZING PRIVATE TESTING MACHINES.

| No. of test. | Mark on specimen. | Diameter. | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 2 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total. | Per square inch. | Total. | Per square inch. | | | | | | | |
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inches.* | *Per ct.* | *In. Sq. in.* | *Per ct.* | | | |
| 6001 | 1 W..... | .505 | .20 | 13,400 | 67,000 | 18,040 | 90,200 | .53 | 26.5 | Diam...33=.0855 | 57.2 | Fine silky, cup shaped, serrated. | ″.32*, ″.21 | From an annealed bar of steel. |
| 6002 | 3 W..... | .505 | .20 | 12,600 | 63,000 | 17,960 | 89,800 | .53 | 26.5 | Diam...33=.0855 | 57.2 | .....do..... | .14, .39* | |
| 6003 | 5 W..... | .505 | .20 | 12,800 | 64,000 | 17,800 | 89,000 | .57 | 28.5 | Diam...32=.0804 | 59.8 | .....do..... | .22, .35* | |
| 6004 | 7 W..... | .505 | .20 | 12,400 | 62,000 | 18,120 | 90,600 | .51 | 25.5 | Diam...33=.0855 | 57.2 | .....do..... | .12, .39* | |
| 6005 | 9 W..... | .505 | .20 | 12,320 | 61,600 | 18,380 | 91,900 | .52 | 26.0 | Diam...33=.0855 | 57.2 | .....do..... | .15, .37* | |
| 6024 | 1..... | .505 | .20 | 9,200 | 46,000 | 18,720 | 93,600 | .46 | 23.0 | Diam...39=.1194 | 40.3 | Silky..... | .14, .32* | |
| 6025 | 2..... | .505 | .20 | 9,600 | 48,000 | 18,820 | 94,100 | .48 | 24.0 | Diam...39=.1194 | 40.3 | .....do..... | .28*, .20 | |
| 6026 | 3..... | .505 | .20 | 9,000 | 45,000 | 18,650 | 93,250 | .48 | 24.0 | Diam...39=.1194 | 40.3 | .....do..... | .26*, .22 | |
| 6027 | 4..... | .505 | .20 | 9,000 | 45,000 | 18,490 | 92,450 | .49 | 24.5 | Diam...40=.1257 | 37.1 | .....do..... | .28*, .21 | |
| 6028 | 5..... | .505 | .20 | 7,600 | 38,000 | 17,830 | 89,150 | .45 | 22.5 | Diam...39=.1194 | 40.3 | .....do..... | .24*, .21 | |
| 6029 | 6..... | .505 | .20 | 9,400 | 47,000 | 18,300 | 91,500 | .52 | 26.0 | Diam...39=.1194 | 40.3 | .....do..... | .28*, .24 | |
| 6030 | 7..... | .505 | .20 | 7,600 | 38,000 | 17,320 | 86,600 | .50 | 25.0 | Diam...38=.1134 | 43.3 | .....do..... | .27*, .23 | |
| 6031 | 8..... | .505 | .20 | 9,000 | 45,000 | 18,460 | 92,300 | .47 | 23.5 | Diam...39=.1194 | 40.3 | .....do..... | .16, .31* | |
| 6032 | 9..... | .505 | .20 | 8,600 | 43,000 | 18,810 | 94,050 | .45 | 22.5 | Diam...39=.1194 | 40.3 | .....do..... | .30*, .15 | |
| 6033 | 10..... | .505 | .20 | 10,200 | 51,000 | 18,540 | 92,700 | .50 | 25.0 | Diam...38=.1134 | 43.3 | .....do..... | .30*, .20 | |

# STEEL BARS

FOR

# STANDARDIZING TESTING MACHINE AT WATERVLIET ARSENAL.

## No. 6131.

Marks, T M 2.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,250 | 25,000 | .000800 | .000200 | ..... | ..... | |
| 7,500 | 30,000 | .001050 | .000250 | .000050 | .000050 | |
| 8,750 | 35,000 | .001200 | .000150 | ..... | ..... | |
| 10,000 | 40,000 | .001350 | .000150 | ..... | ..... | Elastic limit. |
| 10,250 | 41,000 | .002750 | .001400 | ..... | ..... | |
| | | .022000 | .019250 | ..... | ..... | |
| 10,500 | 42,000 | .025150 | .003150 | ..... | ..... | |
| 10,750 | 43,000 | .026900 | .001750 | ..... | ..... | |
| 11,000 | 44,000 | .028250 | .001350 | ..... | ..... | |
| 11,500 | 46,000 | .035250 | .007000 | ..... | ..... | |
| 12,000 | 48,000 | .042250 | .007000 | ..... | ..... | |
| 12,500 | 50,000 | .048600 | .006350 | ..... | ..... | |
| 13,000 | 52,000 | .055500 | .006900 | ..... | ..... | |
| 13,500 | 54,000 | .064000 | .008500 | ..... | ..... | |
| 14,000 | 56,000 | .077000 | .013000 | ..... | ..... | |
| 14,500 | 58,000 | .092250 | .015250 | ..... | ..... | |
| 15,000 | 60,000 | .115000 | .022750 | ..... | ..... | |
| 15,500 | 62,000 | .1700 | .0550 | ..... | ..... | |
| 15,710 | 62,840 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 62,840 |
| Elastic limit per square inch of original section | do... | 40,000 |
| Elongation per inch after rupture | inch.. | .3650 |
| Elongation per inch under strain at elastic limit | do... | .001350 |
| Reduction in diameter at point of rupture | do... | .214 |
| Reduction in area after rupture, per cent of original section | | 61.5 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".35*, ".38* |

## No. 6132.

Marks, T M 4.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 5,000 | 20,000 | .000650 | .000350 | ..... | ..... | |
| 7,500 | 30,000 | .001100 | .000450 | 0. | ..... | |
| 8,750 | 35,000 | .001200 | .000100 | ..... | ..... | |
| 10,000 | 40,000 | .001300 | .000100 | ..... | ..... | |
| 10,250 | 41,000 | .001350 | .000050 | ..... | ..... | |
| 10,500 | 42,000 | .001450 | .000100 | ..... | ..... | |
| 10,750 | 43,000 | .001550 | .000100 | ..... | ..... | |
| 11,000 | 44,000 | .001600 | .000050 | ..... | ..... | Elastic limit. |
| | | .030900 | .029300 | ..... | ..... | |
| 11,250 | 45,000 | .031450 | .000550 | ..... | ..... | |
| 11,500 | 46,000 | .033000 | .001550 | ..... | ..... | |
| 11,750 | 47,000 | .036000 | .003000 | ..... | ..... | |
| 12,000 | 48,000 | .039750 | .003750 | ..... | ..... | |
| 12,500 | 50,000 | .048000 | .008250 | ..... | ..... | |
| 13,000 | 52,000 | .059750 | .011750 | ..... | ..... | |
| 13,500 | 54,000 | .064500 | .004750 | ..... | ..... | |
| 14,000 | 56,000 | .076900 | .012400 | ..... | ..... | |
| 14,500 | 58,000 | .092500 | .015600 | ..... | ..... | |
| 15,000 | 60,000 | .1150 | .0225 | ..... | ..... | |
| 15,500 | 62,000 | .1600 | .0450 | ..... | ..... | |
| 15,710 | 62,840 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 62,840 |
| Elastic limit per square inch of original section | do... | 44,000 |
| Elongation per inch after rupture | inch.. | .3650 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .214 |
| Reduction in area after rupture, per cent of original section | | 61.5 |
| Position of rupture | | 1".3 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".44, ".29 |

## No. 6133.

Marks, T.M–6.
Diameter; ".564.
Sectional area, .25 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,250 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,500 | 10,000 | .000850 | .000250 | ..... | ..... | |
| 5,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 7,500 | 30,000 | .001050 | .000400 | 0. | ..... | |
| 8,750 | 35,000 | .001200 | .000150 | ..... | ..... | |
| 10,000 | 40,000 | .001400 | .000200 | ..... | ..... | |
| 10,250 | 41,000 | .001450 | .000050 | ..... | ..... | |
| 10,500 | 42,000 | .001450 | 0. | ..... | ..... | |
| 10,750 | 43,000 | .001500 | .000050 | ..... | ..... | Elastic limit. |
| | | .025900 | .024400 | ..... | ..... | |
| 11,000 | 44,000 | .028250 | .002350 | ..... | ..... | |
| 11,250 | 45,000 | .030000 | .001750 | ..... | ..... | |
| 11,500 | 46,000 | .034250 | .004250 | ..... | ..... | |
| 11,750 | 47,000 | .036100 | .001850 | ..... | ..... | |
| 12,000 | 48,000 | .040000 | .003900 | ..... | ..... | |
| 12,500 | 50,000 | .045500 | .005500 | ..... | ..... | |
| 13,000 | 52,000 | .054000 | .008500 | ..... | ..... | |
| 13,500 | 54,000 | .063000 | .009000 | ..... | ..... | |
| 14,000 | 56,000 | .075500 | .012500 | ..... | ..... | |
| 14,500 | 58,000 | .091500 | .016000 | ..... | ..... | |
| 15,000 | 60,000 | .113500 | .022000 | ..... | ..... | |
| 15,500 | 62,000 | .1550 | .0415 | ..... | ..... | |
| 15,660 | 62,640 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

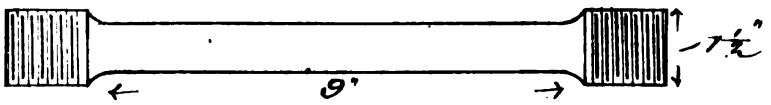
| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 62,640 |
| Elastic limit per square inch of original section | do... | 43,000 |
| Elongation per inch after rupture | inch.. | .3650 |
| Elongation per inch under strain at elastic limit | do... | .001500 |
| Reduction in diameter at point of rupture | do... | .214 |
| Reduction in area after rupture, per cent of original section | | 61.5 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ".38*, ".35* |

# STEEL BARS.

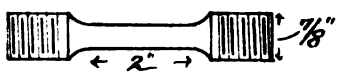
## NICKEL AND CARBON STEEL.

*Forms of specimens.*

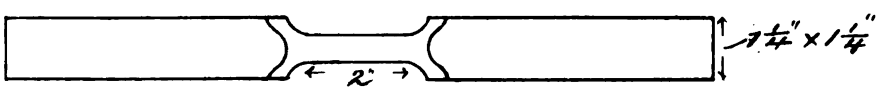
*Nos 6141-6146.*




*Nos. 9542-9545.*




*Nos. 9546 and 9547.*




H Doc 300 56 1

Specimens marked A 1 and A 2, and 1 A and 2 A are nickel steel annealed, those marked T 1 and T 2, and 1 E and 2 E are nickel steel tempered and annealed.

Specimens marked E–15–1 and E–15–2 are made from axle steel containing .44 per cent carbon.

The chemical analysis of the nickel steel, specimens 6141 to 6144, inclusive, and 9542 to 9545, inclusive, was as follows:

| | Per cent. |
|---|---|
| Carbon | .30 |
| Manganese | .73 |
| Silicon | .203 |
| Sulphur | .035 |
| Phosphorus | .027 |
| Copper | .035 |
| Nickel | 3.375 |

## No. 6141.

Marks, A 1.
Diameter, 1″.007.
Sectional area, .7964 square inch.
Gauged length, 5″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 796 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 3,982 | 5,000 | .00010 | .00010 | ..... | ..... | |
| 7,964 | 10,000 | .00024 | .00014 | ..... | ..... | |
| 15,928 | 20,000 | .00056 | .00032 | ..... | ..... | |
| 23,892 | 30,000 | .00092 | .00036 | −.00002 | −.00002 | |
| 27,874 | 35,000 | .00110 | .00018 | ..... | ..... | |
| 31,856 | 40,000 | .00126 | .00016 | ..... | ..... | |
| 35,838 | 45,000 | .00144 | .00018 | ..... | ..... | |
| 39,820 | 50,000 | .00162 | .00018 | ..... | ..... | |
| 40,616 | 51,000 | .00166 | .00004 | ..... | ..... | |
| 41,413 | 52,000 | .00172 | .00006 | ..... | ..... | |
| 42,209 | 53,000 | .00176 | .00004 | ..... | ..... | |
| 43,006 | 54,000 | .00182 | .00006 | ..... | ..... | |
| 43,400 | 54,500 | ..... | ..... | ..... | ..... | Elastic limit. |
| 43,802 | 55,000 | .0120 | .01018 | ..... | ..... | |
| 44,598 | 56,000 | .0140 | .0020 | ..... | ..... | |
| 46,191 | 58,000 | .0160 | .0020 | ..... | ..... | |
| 47,784 | 60,000 | .0180 | .0020 | ..... | ..... | |
| 49,377 | 62,000 | .0200 | .0020 | ..... | ..... | |
| 50,970 | 64,000 | .0240 | .0040 | ..... | ..... | |
| 52,562 | 66,000 | .0260 | .0020 | ..... | ..... | |
| 54,155 | 68,000 | .0280 | .0020 | ..... | ..... | |
| 55,748 | 70,000 | .0320 | .0040 | ..... | ..... | |
| 57,341 | 72,000 | .0360 | .0040 | ..... | ..... | |
| 58,934 | 74,000 | .0400 | .0040 | ..... | ..... | |
| 60,526 | 76,000 | .0440 | .0040 | ..... | ..... | |
| 62,119 | 78,000 | .0520 | .0080 | ..... | ..... | |
| 63,712 | 80,000 | .0580 | .0060 | ..... | ..... | |
| 65,305 | 82,000 | .0660 | .0080 | ..... | ..... | |
| 66,898 | 84,000 | .0760 | .0100 | ..... | ..... | |
| 68,490 | 86,000 | .0920 | .0160 | ..... | ..... | |
| 70,083 | 88,000 | .1220 | .0300 | ..... | ..... | |
| 70,380 | 88,370 | .1420 | .0200 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,370 |
| Elastic limit per square inch of original section | do... | 54,500 |
| Elongation per inch after rupture (in 9 inches) | inch.. | .209 |
| Reduction in diameter at point of rupture | do... | .1164 |
| Reduction in area after rupture, per cent of original section | | 54.4 |
| Position of rupture | | 3″.8 from neck |
| Character of broken surface | | fine silky, cup-shaped |
| Elongation of inch sections | | ″.12, ″.15, ″.16, ″.19, ″.20, ″.48*, ″.33, ″.14, ″.11 |

## No. 6142.

Marks, A–2.
Diameter, 1″.007.
Sectional area, .7964 square inch.
Gauged length, 5″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 796 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 3,982 | 5,000 | .00012 | .00012 | ..... | ..... | |
| 7,964 | 10,000 | .00028 | .00016 | ..... | ..... | |
| 15,928 | 20,000 | .00062 | .00034 | ..... | ..... | |
| 23,892 | 30,000 | .00098 | .00036 | − .00004 | − .00004 | |
| 27,874 | 35,000 | .00114 | .00016 | ..... | ..... | |
| 31,856 | 40,000 | .00132 | .00018 | ..... | ..... | |
| 35,838 | 45,000 | .00150 | .00018 | ..... | ..... | |
| 39,820 | 50,000 | .00168 | .00018 | − .00004 | 0. | |
| 40,616 | 51,000 | .00172 | .00004 | ..... | ..... | |
| 41,413 | 52,000 | .00174 | .00002 | ..... | ..... | |
| 42,209 | 53,000 | .00178 | .00004 | ..... | ..... | |
| 43,006 | 54,000 | .00182 | .00004 | ..... | ..... | |
| 43,802 | 55,000 | .00188 | .00006 | ..... | ..... | |
| 44,598 | 56,000 | .00194 | .00006 | ..... | ..... | Elastic limit. |
| | | .0120 | .00006 | ..... | ..... | |
| 46,191 | 58,000 | .0140 | .0020 | ..... | ..... | |
| 47,784 | 60,000 | .0180 | .0040 | ..... | ..... | |
| 49,377 | 62,000 | .0200 | .0020 | ..... | ..... | |
| 50,970 | 64,000 | .0240 | .0040 | ..... | ..... | |
| 52,562 | 66,000 | .0260 | .0020 | ..... | ..... | |
| 54,155 | 68,000 | .0280 | .0020 | ..... | ..... | |
| 55,748 | 70,000 | .0320 | .0040 | ..... | ..... | |
| 57,341 | 72,000 | .0360 | .0040 | ..... | ..... | |
| 58,934 | 74,000 | .0400 | .0040 | ..... | ..... | |
| 60,526 | 76,000 | .0440 | .0040 | ..... | ..... | |
| 62,119 | 78,000 | .0500 | .0060 | ..... | ..... | |
| 63,712 | 80,000 | .0560 | .0060 | ..... | ..... | |
| 65,305 | 82,000 | .0640 | .0080 | ..... | ..... | |
| 66,898 | 84,000 | .0740 | .0100 | ..... | ..... | |
| 68,490 | 86,000 | .0880 | .0140 | ..... | ..... | |
| 70,083 | 88,000 | .1180 | .0300 | ..... | ..... | |
| 70,800 | 88,900 | .1580 | .0400 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 88,900 |
| Elastic limit per square inch of original section | do... | 56,000 |
| Elongation per inch after rupture (in 9 inches) | inch.. | .210 |
| Elongation per inch under strain at elastic limit | do... | .00194 |
| Reduction in diameter at point of rupture | do... | .1164 |
| Reduction in area after rupture, per cent of original section | | 54.4 |
| Position of rupture | | 3″.8 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ″.12, ″.17, ″.35, ″.45*, ″.19*, ″.17, ″.17, ″.15, ″.12 |

## No. 6143.

Marks, T 1.
Diameter, 1″.005.
Sectional area, .7933 square inch.
Gauged length, 5″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 793 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 3,966 | 5,000 | .00016 | .00016 | 0. | ..... | |
| 7,933 | 10,000 | .00032 | .00016 | ..... | ..... | |
| 15,866 | 20,000 | .00068 | .00036 | ..... | ..... | |
| 23,799 | 30,000 | .00104 | .00036 | 0. | ..... | |
| 27,765 | 35,000 | .00118 | .00014 | ..... | ..... | |
| 31,732 | 40,000 | .00136 | .00018 | ..... | ..... | |
| 35,698 | 45,000 | .00154 | .00018 | ..... | ..... | |
| 39,665 | 50,000 | .00172 | .00018 | 0. | ..... | |
| 40,458 | 51,000 | .00176 | .00004 | ..... | ..... | |
| 41,251 | 52,000 | .00180 | .00004 | ..... | ..... | |
| 42,045 | 53,000 | .00184 | .00004 | ..... | ..... | |
| 42,838 | 54,000 | .00186 | .00002 | ..... | ..... | |
| 43,632 | 55,000 | .00188 | .00002 | ..... | ..... | |
| 44,425 | 56,000 | .00192 | .00004 | ..... | ..... | |
| 45,218 | 57,000 | .00196 | .00004 | ..... | ..... | |
| 46,011 | 58,000 | .00198 | .00002 | ..... | ..... | |
| 46,805 | 59,000 | .00202 | .00004 | ..... | ..... | |
| 47,598 | 60,000 | .00206 | .00004 | 0. | ..... | |
| 48,391 | 61,000 | .00210 | .00004 | ..... | ..... | |
| 49,184 | 62,000 | .00214 | .00004 | ..... | ..... | |
| 49,978 | 63,000 | .00218 | .00004 | ..... | ..... | |
| 50,771 | 64,000 | .00222 | .00004 | 0. | ..... | |
| 55,531 | 70,000 | .0040 | .00178 | ..... | ..... | |
| 57,980 | 73,090 | ..... | ..... | ..... | ..... | Elastic limit. |
| 58,704 | 74,000 | .0220 | .0180 | ..... | ..... | |
| 60,291 | 76,000 | .0260 | .0040 | ..... | ..... | |
| 61,877 | 78,000 | .0300 | .0040 | ..... | ..... | |
| 63,464 | 80,000 | .0320 | .0020 | ..... | ..... | |
| 66,637 | 84,000 | .0400 | .0080 | ..... | ..... | |
| 69,810 | 88,000 | .0520 | .0120 | ..... | ..... | |
| 72,984 | 92,000 | .0660 | .0140 | ..... | ..... | |
| 76,157 | 96,000 | .1020 | .0360 | ..... | ..... | |
| 77,180 | 97,290 | .1440 | .0420 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 97,290 |
| Elastic limit per square inch of original section | do... | 73,090 |
| Elongation per inch after rupture (in 9 inches) | inch.. | .186 |
| Reduction in diameter at point of rupture | do... | .345 |
| Reduction in area after rupture, per cent of original section | | 56.9 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ″.09, ″.10, ″.12, ″.16, ″.57*, ″.23, ″.16, ″.14, ″.10 |

## No. 6144.

Marks, T 2.
Diameter, 1″.005.
Sectional area, .7933 square inch.
Gauged length, 5″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 793 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 3,966 | 5,000 | .00014 | .00014 | 0. | ..... | |
| 7,933 | 10,000 | .00032 | .00018 | ..... | ..... | |
| 15,866 | 20,000 | .00066 | .00034 | ..... | ..... | |
| 23,799 | 30,000 | .00102 | .00036 | 0. | ..... | |
| 31,732 | 40,000 | .00136 | .00034 | ..... | ..... | |
| 39,665 | 50,000 | .00168 | .00032 | ..... | ..... | |
| 47,598 | 60,000 | .00204 | .00036 | ..... | ..... | |
| 50,771 | 64,000 | .00218 | .00014 | 0. | ..... | |
| 55,531 | 70,000 | .0040 | .00182 | ..... | ..... | Elastic limit. |
| | | .0200 | .00160 | ..... | ..... | |
| 57,118 | 72,000 | .0220 | .0020 | ..... | ..... | |
| 58,704 | 74,000 | .0240 | .0020 | ..... | ..... | |
| 60,291 | 76,000 | .0280 | .0040 | ..... | ..... | |
| 61,877 | 78,000 | .0320 | .0040 | ..... | ..... | |
| 63,464 | 80,000 | .0360 | .0040 | ..... | ..... | |
| 66,637 | 84,000 | .0440 | .0080 | ..... | ..... | |
| 69,810 | 88,000 | .0560 | .0120 | ..... | ..... | |
| 72,984 | 92,000 | .0760 | .0200 | ..... | ..... | |
| 76,157 | 96,000 | .1300 | .0540 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 96,000 |
| Elastic limit per square inch of original section | do... | 70,000 |
| Elongation per inch after rupture | inch.. | .182 |
| Elongation per inch under strain at elastic limit | do... | .0040 |
| Reduction in diameter at point of rupture | do... | .335 |
| Reduction in area after rupture, per cent of original section | | 55.6 |
| Position of rupture | | ″.5 from neck |
| Character of broken surface | | fine silky, cup shaped |
| Elongation of inch sections | | ″.09, ″.12, ″.13, ″.15, ″.48*, ″.30, ″.14, ″.13, ″.10 |

## No. 6145.

Marks, E–15–1.
Diameter, ″.996.
Sectional area, .779 square inch.
Gauged length, 5″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 779 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 3,895 | 5,000 | .00016 | .00016 | ..... | ..... | |
| 7,790 | 10,000 | .00032 | .00016 | ..... | ..... | |
| 15,580 | 20,000 | .00068 | .00036 | ..... | ..... | |
| 23,370 | 30,000 | .00104 | .00036 | .00004 | .00004 | |
| 24,149 | 31,000 | .00108 | .00004 | ..... | ..... | |
| 24,928 | 32,000 | .00116 | .00008 | ..... | ..... | Elastic limit. |
| 25,707 | 33,000 | .0080 | .00684 | ..... | ..... | |
| 27,265 | 35,000 | .0100 | .0020 | ..... | ..... | |
| 29,602 | 38,000 | .0120 | .0020 | ..... | ..... | |
| 31,160 | 40,000 | .0140 | .0020 | ..... | ..... | |
| 35,055 | 45,000 | .0180 | .0040 | ..... | ..... | |
| 38,950 | 50,000 | .0240 | .0060 | ..... | ..... | |
| 42,845 | 55,000 | .0320 | .0080 | ..... | ..... | |
| 46,740 | 60,000 | .0400 | .0080 | ..... | ..... | |
| 50,635 | 65,000 | .0540 | .0140 | ..... | ..... | |
| 54,530 | 70,000 | .0760 | .0220 | ..... | ..... | |
| 58,425 | 75,000 | .1220 | .0460 | ..... | ..... | |
| 59,240 | 76,050 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 76,050 |
| Elastic limit per square inch of original section | do... | 32,000 |
| Elongation per inch after rupture (in 9 inches) | inch.. | .208 |
| Elongation per inch under strain at elastic limit | do... | .00116 |
| Reduction in diameter at point of rupture | do... | .216 |
| Reduction in area after rupture, per cent of original section | | 38.6 |
| Position of rupture | | 3″.6 from neck |
| Character of broken surface | | silky 40 per cent, granular 60 per cent |
| Elongation of inch sections | | ″.17, ″.23, ″.45*, ″.29, ″.19, ″.17, ″.14, ″.12, ″.11 |

## No. 6146.

Marks, E–15–2.
Diameter, ″.998.
Sectional area, .782 square inch.
Gauged length, 5″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 782 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 3,910 | 5,000 | .00016 | .00016 | 0. | ..... | |
| 7,820 | 10,000 | .00032 | .00016 | ..... | ..... | |
| 15,640 | 20,000 | .00068 | .00036 | ..... | ..... | |
| 23,460 | 30,000 | .00102 | .00034 | 0. | ..... | |
| 24,100 | 30,820 | ..... | ..... | ..... | ..... | Elastic limit. |
| 24,242 | 31,000 | .00270 | .00168 | ..... | ..... | |
| 25,024 | 32,000 | .0080 | .0053 | ..... | ..... | |
| 27,370 | 35,000 | .0100 | .0020 | ..... | ..... | |
| 28,934 | 37,000 | .0120 | .0020 | ..... | ..... | |
| 31,280 | 40,000 | .0160 | .0040 | ..... | ..... | |
| 35,190 | 45,000 | .0200 | .0040 | ..... | ..... | |
| 39,100 | 50,000 | .0280 | .0080 | ..... | ..... | |
| 43,010 | 55,000 | .0360 | .0080 | ..... | ..... | |
| 46,920 | 60,000 | .0500 | .0140 | ..... | ..... | |
| 50,830 | 65,000 | .0680 | .0180 | ..... | ..... | |
| 54,740 | 70,000 | .1020 | .0340 | ..... | ..... | |
| 56,910 | 72,770 | .1760 | .0740 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 72,770 |
| Elastic limit per square inch of original section | do... | 30,820 |
| Elongation per inch after rupture | inch.. | .210 |
| Reduction in diameter at point of rupture | do... | .248 |
| Reduction in area after rupture, per cent of original section | | 43.5 |
| Position of rupture | | 2″.3 from neck |
| Character of broken surface | | silky |
| Elongation of inch sections | | ″.13, ″.17, ″.16, ″.15, ″,17, ″.17, ″.26, ″.49, ″.19 |

## TABULATION OF TENSION TESTS OF NICKEL AND CARBON STEEL FROM PENNSYLVANIA RAILROAD COMPANY.

| No. of test. | Mark on specimen. | Diameter. | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 9 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total. | Per square inch. | Total. | Per square inch. | | | | | | |
| | | *Inch.* | *Sq. in.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per ct.* | *In. Sq. in.* | *Per ct.* | | " " " " " " " " " |
| 6141 | A-1 | 1.007 | .7964 | 43,400 | 44,500 | 70,380 | 88,370 | 1.88 | 20.9 | Diam.. .68=.3632 | 54.4 | Fine silky, cup shaped | .12, .15, .16, .19, .20, .48*, .33, .14, .11. |
| 6142 | A-2 | 1.007 | .7964 | 44,598 | 56,000 | 70,800 | 88,900 | 1.89 | 21.0 | Diam.. .68=.3632 | 54.4 | do | .12, .17, .35, .45*, .19, .17, .17, .15, .12. |
| 6143 | T-1 | 1.005 | .7933 | 57,980 | 73,090 | 77,180 | 97,290 | 1.67 | 18.6 | Diam.. .66=.3421 | 56.9 | do | .09, .10, .12, .16, .57*, .23, .16, .14, .10. |
| 6144 | T-2 | 1.005 | .7933 | 55,531 | 70,000 | 76,157 | 96,000 | 1.64 | 18.2 | Diam.. .67=.3526 | 55.6 | do | .09, .12, .13, .15, .48*, .30, .14, .13, .10, |
| 6145 | E-15-1 | .996 | .779 | 24,928 | 32,000 | 59,240 | 76,050 | 1.87 | 20.8 | Diam.. .78=.478 | 38.6 | Silky 40 per cent, granular 60 per cent. | .17, .23, .45*, .29, .19, .17, .14, .12, .11. |
| 6146 | E-15-2 | .998 | .782 | 24,100 | 30,820 | 56,910 | 72,770 | 1.89 | 21.0 | Diam.. .75=.442 | 43.5 | Silky | .13, .17, .16, .15, .17, .17, .26, .49*, .19. |
| | | | | | | | | Elongation in 2 inches. | | | | | |
| | | | | | | | | *Inch.* | *Per ct.* | | | | |
| 9542 | 1-A | .515 | .208 | 11,920 | 57,310 | 19,070 | 91,680 | .53 | 26.5 | Diam.. .34=.091 | 56.2 | Silky, cup shaped | .25, .28*. |
| 9544 | 2-A | .516 | .209 | 11,600 | 55,500 | 18,910 | 90,480 | .53 | 26.5 | Diam.. .34=.091 | 56.5 | do | .26, .27*. |
| 9543 | 1-E | .516 | .209 | 15,510 | 74,210 | 21,060 | 100,770 | .46 | 23.0 | Diam.. .33=.086 | 58.9 | Fine silky, cup shaped | .10, .36*. |
| 9545 | 2-E | .520 | .212 | 15,610 | 73,630 | 21,500 | 101,410 | .48 | 24.0 | Diam.. .33=.086 | 59.4 | do | .14, .34*. |
| 9546 | E-15-1 | .508 | .203 | ..... | ..... | 16,040 | 79,010 | .48 | 24.0 | Diam.. .39=.119 | 41.4 | Silky | |
| 9547 | E-15-2 | .513 | .207 | ..... | ..... | 15,460 | 74,690 | .55 | 27.5 | Diam.. .38=.113 | 45.4 | do | |

# STEEL BARS

FOR

# ORDNANCE MATERIAL.

681

No. 6111.

Marks, D.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000450 | .000350 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000200 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000300 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000350 | ..... | ..... | |
| 10,000 | 50,000 | .001650 | .000350 | 0. | ..... | |
| 11,400 | 57,000 | .001950 | .000300 | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 10,400 | 52,000 | .003400 | .001450 | ..... | ..... | |
| 10,600 | 53,000 | .004150 | .000750 | ..... | ..... | |
| 10,800 | 54,000 | .008750 | .004600 | ..... | ..... | |
| 11,000 | 55,000 | .013750 | .005000 | ..... | ..... | |
| 11,200 | 56,000 | .014400 | .000650 | ..... | ..... | |
| 11,600 | 58,000 | .016550 | .002150 | ..... | ..... | |
| 12,000 | 60,000 | .018000 | .001450 | ..... | ..... | |
| 12,800 | 64,000 | .023000 | .005000 | ..... | ..... | |
| 13,600 | 68,000 | .028600 | .005600 | ..... | ..... | |
| 14,400 | 72,000 | .034500 | .005900 | ..... | ..... | |
| 15,200 | 76,000 | .043000 | .008500 | ..... | ..... | |
| 16,000 | 80,000 | .053000 | .010000 | ..... | ..... | |
| 16,800 | 84,000 | .0750 | .0220 | ..... | ..... | |
| 17,600 | 88,000 | .1000 | .0250 | ..... | ..... | |
| 18,090 | 90,450 | .1550 | .0550 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,450 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .2700 |
| Elongation per inch under strain at elastic limit | do... | .001950 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | ".9 from neck |
| Character of broken surface | | fine, silky |
| Elongation of inch sections | | ".16, ".38* |

## No. 6112.

Marks, H.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000400 | .000300 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001300 | .000300 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | .000300 | 0. | ..... | |
| 11,400 | 57,000 | .001950 | .000350 | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 10,400 | 52,000 | .003400 | .001450 | ..... | ..... | |
| 10,600 | 53,000 | .012000 | .008600 | ..... | ..... | |
| 10,800 | 54,000 | .013100 | .001100 | ..... | ..... | |
| 11,000 | 55,000 | .013500 | .000400 | ..... | ..... | |
| 11,200 | 56,000 | .014050 | .000550 | ..... | ..... | |
| 11,600 | 58,000 | .016100 | .002050 | ..... | ..... | |
| 12,000 | 60,000 | .018400 | .002300 | ..... | ..... | |
| 12,800 | 64,000 | .023150 | .004750 | ..... | ..... | |
| 13,600 | 68,000 | .029000 | .005850 | ..... | ..... | |
| 14,400 | 72,000 | .036000 | .007000 | ..... | ..... | |
| 15,200 | 76,000 | .043550 | .007550 | ..... | ..... | |
| 16,000 | 80,000 | .055900 | .012350 | ..... | ..... | |
| 16,800 | 84,000 | .070000 | .014100 | ..... | ..... | |
| 17,600 | 88,000 | .1000 | .0300 | ..... | ..... | |
| 18,070 | 90,350 | .1650 | .0650 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,350 |
| Elastic limit per square inch of original section | do... | 57,000 |
| Elongation per inch after rupture | inch.. | .2800 |
| Elongation per inch under strain at elastic limit | do... | .001950 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | 1".10 from neck |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".19, ".37* |

No. 6113.

**Marks, L.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000600 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000350 | ..... | ..... | |
| 8,000 | 40,000 | .001250 | .000300 | ..... | ..... | |
| 10,000 | 50,000 | .001600 | .000350 | 0. | ..... | |
| 11,000 | 55,000 | .001800 | .000200 | ..... | ..... | Elastic limit. |
| | | | | | | Load fell. |
| 10,200 | 51,000 | .003250 | .001450 | ..... | ..... | |
| 10,400 | 52,000 | .003650 | .000400 | ..... | ..... | |
| 10,600 | 53,000 | .007000 | .003350 | ..... | ..... | |
| 10,800 | 54,000 | .013500 | .006500 | ..... | ..... | |
| 11,200 | 56,000 | .014400 | .000900 | ..... | ..... | |
| 11,600 | 58,000 | .016700 | .002300 | ..... | ..... | |
| 12,000 | 60,000 | .018500 | .001800 | ..... | ..... | |
| 12,800 | 64,000 | .023750 | .005250 | ..... | ..... | |
| 13,600 | 68,000 | .029500 | .005750 | ..... | ..... | |
| 14,400 | 72,000 | .034900 | .005400 | ..... | ..... | |
| 15,200 | 76,000 | .045250 | .010350 | ..... | ..... | |
| 16,000 | 80,000 | .055500 | .010250 | ..... | ..... | |
| 16,800 | 84,000 | .0750 | .0195 | ..... | ..... | |
| 17,600 | 88,000 | .1000 | .0250 | ..... | ..... | |
| 18,010 | 90,050 | .1700 | .0700 | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 90,050 |
| Elastic limit per square inch of original section | do... | 55,000 |
| Elongation per inch after rupture | inch.. | .2950 |
| Elongation per inch under strain at elastic limit | do... | .001800 |
| Reduction in diameter at point of rupture | do... | .145 |
| Reduction in area after rupture, per cent of original section | | 49.1 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | fine silky |
| Elongation of inch sections | | ".29*, ".30* |

## STEEL FOR CARRIER RINGS.

| Mark on specimen. | Diameter. | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 2 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total. | Per square inch. | Total. | Per square inch. | | | | | | |
| | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per ct.* | *In. Sq. in.* | *Per ct.* | | |
| | .505 | .20 | 12,200 | 61,000 | 18,420 | 92,100 | .53 | 26.5 | Diam.. .31=.0755 | 62.2 | Fine silky | Oil treated. |
| • | .505 | .20 | 9,980 | 49,900 | 15,920 | 79,600 | .60 | 30.0 | Diam.. .34=.0908 | 54.6 | .....do | Annealed in sand. |
| •• | .505 | .20 | 10,950 | 54,750 | 18,010 | 90,050 | .50 | 25.0 | Diam.. .34=.0908 | 54.6 | .....do | Air cooled. |
| 1 | .505 | .20 | 7,220 | 36,100 | 15,280 | 76,400 | .35 | 17.5 | Diam.. .36=.1018 | 49.1 | Silky | |
| 2 | .505 | .20 | 7,150 | 35,750 | 15,580 | 77,900 | .34 | 17.0 | Diam.. .36=.1018 | 49.1 | .....do | |
| 3 | .505 | .20 | 7,800 | 39,000 | 15,320 | 76,600 | .33 | 16.5 | Diam.. .36=.1018 | 49.1 | .....do | |
| CARRIER RINGS FOR 7-INCH MORTARS. | | | | | | | | | | | | |
| 1 | .564 | .25 | 12,960 | 51,840 | 22,410 | 89,640 | .44 | 22.0 | Diam.. .41=.1320 | 47.2 | Silky | |
| 2 | .564 | .25 | 13,100 | 52,400 | 20,520 | 82,080 | .55 | 27.5 | Diam.. .39=.1194 | 52.2 | .....do | |
| 3 | .505 | .20 | 9,620 | 48,100 | 16,510 | 82,550 | [1].66 | 22.0 | Diam.. .35=.0962 | 51.9 | .....do | |
| [1] Elongation in 3″. | | | | | | | | | | | | |
| CARRIER RINGS FOR 3.6-INCH MORTARS. | | | | | | | | | | | | |
| 1 | .505 | .20 | 11,400 | 57,000 | 17,510 | 87,550 | .54 | 27.0 | Diam.. .31=.0755 | 62.2 | Fine silky | |
| 2 | .505 | .20 | 12,390 | 61,950 | 19,120 | 95,600 | .48 | 24.0 | Diam.. .33=.0855 | 57.2 | .....do | |
| 3 | .505 | .20 | 11,920 | 59,600 | 18,100 | 90,500 | .53 | 26.5 | Diam.. .32=.0804 | 59.8 | .....do | |

## FRACTURED STEEL COUNTERSHAFT.

Longitudinal specimens from 2 1/16" blower countershaft which fractured in service.

| Diameter. | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 8 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Total. | Per square inch. | Total. | Per square inch. | | | | | |
| *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per cent.* | *In. Sq. in.* | *Per cent.* | |
| .564 | .25 | 14,850 | 59,400 | 18,810 | 75,240 | .63 | 21.0 | Diam.. .37=.1075 | 57.0 | Fine silky. |
| .564 | .25 | 14,620 | 58,480 | 18,710 | 74,840 | .62 | 20.7 | Diam.. .37=.1075 | 57.0 | Do. |

NOTE.—A specimen 1"×¼" in cross-sections dimensions was taken from shaft alongside these tension specimens and bent cold 180° without fracture.

# STEEL CASTING.

Samples marked 1 and 2 for compression and tension tests, respectively, were taken out of the casting side by side.

## Compression Tests.

### No. 1165.

Marks, 1.
Length, 3″.86.
Diameter, 1″.006.
Sectional area, .795 square inch.
Gauged length, 3″.

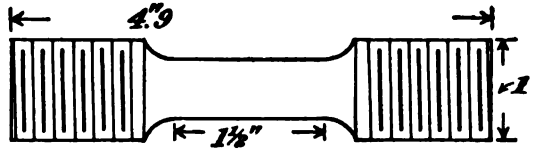
| Applied loads. | | Compression per inch. | Successive compression per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 795 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,590 | 2,000 | 0. | 0. | | | |
| 2,385 | 3,000 | .000033 | .000033 | | | |
| 3,180 | 4,000 | .000033 | 0. | | | |
| 3,975 | 5,000 | .000067 | .000034 | | | |
| 4,770 | 6,000 | .000100 | .000033 | | | |
| 5,565 | 7,000 | .000133 | .000033 | | | |
| 6,360 | 8,000 | .000167 | .000034 | | | |
| 7,155 | 9,000 | .000167 | 0. | | | |
| 7,950 | 10,000 | .000200 | .000033 | 0. | | |
| 8,745 | 11,000 | .000200 | 0. | | | |
| 9,540 | 12,000 | .000233 | .000033 | | | |
| 10,335 | 13,000 | .000267 | .000034 | | | |
| 11,130 | 14,000 | .000300 | .000033 | | | |
| 11,925 | 15,000 | .000333 | .000033 | 0. | | |
| 12,720 | 16,000 | .000367 | .000034 | | | |
| 13,515 | 17,000 | .000400 | .000033 | | | |
| 14,310 | 18,000 | .000433 | .000033 | | | |
| 15,105 | 19,000 | .000467 | .000034 | | | |
| 15,900 | 20,000 | .000500 | .000033 | 0. | | |
| 16,695 | 21,000 | .000533 | .000033 | | | |
| 17,490 | 22,000 | .000567 | .000034 | | | |
| 18,285 | 23,000 | .000567 | 0. | | | |
| 19,080 | 24,000 | .000600 | .000033 | | | |
| 19,875 | 25,000 | .000633 | .000033 | 0. | | |
| 20,670 | 26,000 | .000667 | .000034 | | | |
| 21,465 | 27,000 | .000700 | .000033 | | | |
| 22,260 | 28,000 | .000733 | .000033 | | | |
| 23,055 | 29,000 | .000767 | .000034 | | | |
| 23,850 | 30,000 | .000800 | .000033 | 0. | | |
| 24,645 | 31,000 | .000833 | .000033 | | | |
| 25,440 | 32,000 | .000867 | .000034 | | | Elastic limi |
| 26,235 | 33,000 | .000933 | .000066 | | | |
| 27,030 | 34,000 | .001033 | .000100 | | | |
| 27,825 | 35,000 | .001300 | .000267 | | | |
| 28,620 | 36,000 | .011533 | .000233 | | | |
| 29,415 | 37,000 | .012333 | .000800 | | | |
| 30,210 | 38,000 | .012967 | .000634 | | | |
| 31,005 | 39,000 | .014000 | .001033 | | | |
| 31,800 | 40,000 | .015200 | .001200 | | | |
| 86,300 | 108,550 | | | | | Ultimate strength. |

Failed by triple flexure.

## No. 1166.

Marks, 2.
Length, 2″.45.
Diameter, 1″.005.
Sectional area, .793 square inch.
Approximate elastic limit, 28,300 pounds = 35,680 pounds per square inch.
No compressive ultimate strength found.
200,000 pounds total load applied, which shortened the sample to ″.92 long.
Test discontinued.

### Tension Tests.




| Test of No. | Mark on specimen. | Diameter. | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 1 inch. | | Area at fracture. | Contraction of area. | Appearance of fracture. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total. | Per sq. inch. | Total. | Per sq. inch. | | | | | |
| | | *Inch.* | *Sq. in.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Per ct.* | *Inch.* *Sq. in.* | *Per ct.* | |
| 2590 | 1 | .564 | .25 | 9,710 | 38,840 | 15,600 | 62,400 | .09 | 9 | ..... | ..... | Spongy; fractured at neck. |
| 2591 | 2 | .564 | .25 | 9,410 | 37,640 | 17,700 | 70,800 | .20 | 20 | Diam..49 = 1886 | 24.6 | Silky. |

# STEEL CASTINGS

FOR

# HINGE LUG PLATES, 10-INCH AND 12-INCH RIFLES.

No. 6118.

Marks, H P 1.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | | |
| 2,000 | 10,000 | .000300 | .000200 | | | |
| 4,000 | 20,000 | .000600 | .000300 | | | |
| 6,000 | 30,000 | .001050 | .000450 | .000050 | .000050 | |
| 6,200 | 31,000 | .001100 | .000050 | | | |
| 6,400 | 32,000 | .001150 | .000050 | | | Elastic limit. |
| 6,600 | 33,000 | .002000 | .000850 | | | |
| 6,800 | 34,000 | .010750 | .008750 | | | |
| 7,000 | 35,000 | .012250 | .001500 | | | |
| 7,200 | 36,000 | .013500 | .001250 | | | |
| 7,400 | 37,000 | .014500 | .001000 | | | |
| 7,600 | 38,000 | .015950 | .001450 | | | |
| 8,000 | 40,000 | .018100 | .002150 | | | |
| 8,400 | 42,000 | .021000 | .002900 | | | |
| 8,800 | 44,000 | .024000 | .003000 | | | |
| 9,200 | 46,000 | .027500 | .003500 | | | |
| 9,600 | 48,000 | .030000 | .002500 | | | |
| 10,000 | 50,000 | .035400 | .005400 | | | |
| 10,400 | 52,000 | .039250 | .003850 | | | |
| 11,200 | 56,000 | .0500 | .010750 | | | |
| 12,000 | 60,000 | .0650 | .0150 | | | |
| 12,800 | 64,000 | .0850 | .0200 | | | |
| 13,600 | 68,000 | .1350 | .0500 | | | |
| 13,910 | 69,550 | | | | | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 69,550 |
| Elastic limit per square inch of original section | do... | 32,000 |
| Elongation per inch after rupture | inch.. | .2700 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .095 |
| Reduction in area after rupture, per cent of original section | | 34.0 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | silky, oblique |
| Elongation of inch sections | | ".37*, ".27* |

## No. 6119.

Marks, H P 2.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001000 | .000350 | 0. | ..... | |
| 6,200 | 31,000 | .001100 | .000100 | ..... | ..... | Elastic limit. |
| 6,400 | 32,000 | .011000 | .009900 | ..... | ..... | |
| 6,600 | 33,000 | .011500 | .000500 | ..... | ..... | |
| 6,800 | 34,000 | .012550 | .001050 | ..... | ..... | |
| 7,000 | 35,000 | .013400 | .000850 | ..... | ..... | |
| 7,200 | 36,000 | .015000 | .001600 | ..... | ..... | |
| 7,600 | 38,000 | .017400 | .002400 | ..... | ..... | |
| 8,000 | 40,000 | .020500 | .003100 | ..... | ..... | |
| 8,400 | 42,000 | .023500 | .003000 | ..... | ..... | |
| 8,800 | 44,000 | .027250 | .003750 | ..... | ..... | |
| 9,200 | 46,000 | .031500 | .004250 | ..... | ..... | |
| 9,600 | 48,000 | .035500 | .004000 | ..... | ..... | |
| 10,000 | 50,000 | .040500 | .005000 | ..... | ..... | |
| 10,400 | 52,000 | .045650 | .005150 | ..... | ..... | |
| 11,200 | 56,000 | .0600 | .014350 | ..... | ..... | |
| 12,000 | 60,000 | .0800 | .0200 | ..... | ..... | |
| 12,800 | 64,000 | .1250 | .0450 | ..... | ..... | |
| 12,920 | 64,600 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 64,600 |
| Elastic limit per square inch of original section | do... | 31,000 |
| Elongation per inch after rupture | inch.. | .1500 |
| Elongation per inch under strain at elastic limit | do... | .001100 |
| Reduction in diameter at point of rupture | do... | .055 |
| Reduction in area after rupture, per cent of original section | | 20.5 |
| Position of rupture | | ″.7 from neck |
| Character of broken surface | | granular 50 per cent, silky 50 per cent |
| Elongation of inch sections | | $\frac{8}{8}$″.13, $\frac{7}{8}$″.17$_5$ |

## No. 6120.

**Marks, H P 3.**
**Diameter, ".505.**
**Sectional area, .20 square inch.**
**Gauged length, 2".**

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000350 | .000250 | ..... | ..... | |
| 4,000 | 20,000 | .000650 | .000300 | ..... | ..... | |
| 6,000 | 30,000 | .001050 | .000400 | .000050 | .000050 | |
| 7,000 | 35,000 | .001400 | .000350 | ..... | ..... | |
| 7,200 | 36,000 | .001450 | .000050 | ..... | ..... | |
| 7,400 | 37,000 | .001450 | 0. | ..... | ..... | |
| 7,600 | 38,000 | .001500 | .000050 | ..... | ..... | |
| 7,800 | 39,000 | .001600 | .000100 | ..... | ..... | Elastic limit. |
| 8,000 | 40,000 | .011250 | .009650 | ..... | ..... | |
| 8,200 | 41,000 | .012500 | .001250 | ..... | ..... | |
| 8,400 | 42,000 | .013500 | .001000 | ..... | ..... | |
| 8,800 | 44,000 | .015500 | .002000 | ..... | ..... | |
| 9,200 | 46,000 | .017750 | .002250 | ..... | ..... | |
| 9,600 | 48,000 | .019500 | .001750 | ..... | ..... | |
| 10,000 | 50,000 | .022100 | .002600 | ..... | ..... | |
| 10,400 | 52,000 | .025000 | .002900 | ..... | ..... | |
| 11,400 | 56,000 | .0350 | .0100 | ..... | ..... | |
| 12,000 | 60,000 | .0400 | .0050 | ..... | ..... | |
| 12,800 | 64,000 | .0500 | .0100 | ..... | ..... | |
| 13,600 | 68,000 | .0600 | .0100 | ..... | ..... | |
| 14,400 | 72,000 | .0800 | .0200 | ..... | ..... | |
| 15,200 | 76,000 | .1150 | .0350 | ..... | ..... | |
| 15,440 | 77,200 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 77,200 |
| Elastic limit per square inch of original section | do... | 39,000 |
| Elongation per inch after rupture | inch.. | .2100 |
| Elongation per inch under strain at elastic limit | do... | .001600 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | at middle of stem |
| Character of broken surface | | granular 60 per cent, silky 40 per cent |
| Elongation of inch sections | | ".20*, ".22* |

## No. 6121.

Marks, H P 4.
Diameter, ".505.
Sectional area, .20 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 200 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 1,000 | 5,000 | .000100 | .000100 | 0. | ..... | |
| 2,000 | 10,000 | .000300 | .000200 | ..... | ..... | |
| 4,000 | 20,000 | .000550 | .000250 | ..... | ..... | |
| 6,000 | 30,000 | .000950 | .000400 | 0. | ..... | |
| 7,000 | 35,000 | .001150 | .000200 | ..... | ..... | Elastic limit. |
| 7,200 | 36,000 | .008250 | .007100 | ..... | ..... | |
| 7,400 | 37,000 | .010000 | .001750 | ..... | ..... | |
| 7,600 | 38,000 | .010500 | .000500 | ..... | ..... | |
| 7,800 | 39,000 | .010900 | .000400 | ..... | ..... | |
| 8,000 | 40,000 | .011800 | .000900 | ..... | ..... | |
| 8,400 | 42,000 | .013500 | .001700 | ..... | ..... | |
| 8,800 | 44,000 | .015700 | .002200 | ..... | ..... | |
| 9,200 | 46,000 | .018000 | .002300 | ..... | ..... | |
| 9,600 | 48,000 | .020500 | .002500 | ..... | ..... | |
| 10,000 | 50,000 | .022600 | .002100 | ..... | ..... | |
| 10,400 | 52,000 | .025500 | .002900 | ..... | ..... | |
| 11,200 | 56,000 | .0350 | .0095 | ..... | ..... | |
| 12,000 | 60,000 | .0400 | .0050 | ..... | ..... | |
| 12,800 | 64,000 | .0500 | .0100 | ..... | ..... | |
| 13,600 | 68,000 | .0650 | .0150 | ..... | ..... | |
| 14,400 | 72,000 | .0850 | .0200 | ..... | ..... | |
| 15,100 | 75,500 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 75,500 |
| Elastic limit per square inch of original section | do... | 35,000 |
| Elongation per inch after rupture | inch.. | .2000 |
| Elongation per inch under strain at elastic limit | do... | .001150 |
| Reduction in diameter at point of rupture | do... | .075 |
| Reduction in area after rupture, per cent of original section | | 27.4 |
| Position of rupture | | ".95 from neck |
| Character of broken surface | | granular 70 per cent, silky 30 per cent. |
| Elongation of inch sections | | ".25", ".15 |

# BRONZE.

## GUN-CARRIAGE METAL.

### 3-INCH FIELD CARRIAGE.

| Description. | Marks. | Diameter. | Sectional area. | Tensile strength. | | Elongation in 2 inches. | Contraction of area. | Fracture. |
|---|---|---|---|---|---|---|---|---|
| | | | | Total. | Per square inch. | | | |
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | |
| Cradle | 1 | .798 | .50 | 14,810 | 29,620 | 5.0 | 4.4 | Lavender-yellow color with brilliant needlelike crystallization. |
| Do | 2 | .798 | .50 | 14,360 | 28,720 | 5.0 | 4.4 | Do. |
| Do | 3 | .798 | .50 | 18,420 | 36,840 | 5.0 | 4.4 | Light yellow, brilliant needlelike crystals. |
| Do | 4 | .564 | .25 | 11,040 | 44,160 | 13.0 | 15.0 | Uniform light-yellow color. |
| Do | 5 | .564 | .25 | 10,180 | 40,720 | 10.5 | 11.8 | Do. |

### 15-POUNDER GUN MOUNTS.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Oscillating slide | A 1 O S 15 | .798 | .50 | 15,380 | 30,760 | 19.0 | 16.2 | Light yellow, in part interspersed with darker yellow metal. |
| Recoil sleeve | A 1 R S 15 | .798 | .50 | 18,390 | 36,780 | 24.5 | 20.8 | Light yellow, with section of golden yellow at the circumference. |
| Do | A 6 R S 15 | .798 | .50 | 13,720 | 27,440 | 18.0 | 18.6 | Patches of light-yellow, golden-yellow, and greenish-yellow metal interspersed. |
| Do | A 5 R S 15 | .798 | .50 | 14,100 | 28,200 | 17.5 | 16.4 | Light-yellow and golden-yellow metal interspersed. |
| Do | A 6 R S 15 | .798 | .50 | 18,030 | 36,060 | 23.5 | 23.0 | Golden-yellow color. |
| Do | A 7 R S 15 | .798 | .50 | 17,910 | 35,820 | 12.5 | 16.4 | Light yellow with belt of lavender color across middle of surface. |
| Do | A 2 2 R S 15 | .798 | .50 | 10,720 | 21,440 | 13.5 | 11.6 | Golden-yellow, irregular surface. Opened cracks along the stem. |
| Pivot yoke | A 1 P Y 15 | .798 | .50 | 17,080 | 34,160 | 30.5 | 27.4 | Dark golden yellow, lighter at the circumference. |
| Do | A 2 P Y 15 | .798 | .50 | 19,790 | 39,580 | 37.0 | 31.6 | Light yellow, darker on one side. |
| Do | A 3 P Y 15 | .798 | .50 | 13,960 | 27,920 | 7.5 | 6.8 | Light-yellow and lavender-colored metal interspersed. |
| Do | A 4 P Y 15 | .798 | .50 | 15,510 | 31,020 | 19.0 | 23.0 | Uniform golden yellow. |

# GUN-CARRIAGE METAL—Continued.

## 15-POUNDER GUN MOUNTS—Continued.

| Description. | Marks. | Diameter. | Sectional area. | Tensile strength. | | Elongation in 2 inches. | Contraction of area. | Fracture. |
|---|---|---|---|---|---|---|---|---|
| | | | | Total. | Per square inch. | | | |
| | | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* | |
| Pivot yoke | A 5 P Y 15 | .798 | .50 | 19,560 | 39,120 | 16.5 | 18.6 | Light yellow with belt of lavender color across middle of surface. |
| Do | A 6 P Y 15 | .798 | .50 | 20,920 | 41,840 | 26.5 | 23.0 | Dark-yellow color, with a band of lavender-colored metal across center of surface. |
| Do | A 7 P Y 15 | .798 | .50 | 17,610 | 35,220 | 16.0 | 18.6 | Do. |
| Do | A 8 P Y 15 | .798 | .50 | 21,020 | 42,040 | 33.5 | 31.6 | Dark golden yellow. |

## 6-POUNDER GUN MOUNTS.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Pivot saddle | A 1 P S 6 | .798 | .50 | 17,480 | 34,960 | 33.5 | 27.4 | Light yellow. |
| Recoil sleeve | A 2 R S 6 | .798 | .50 | 11,720 | 23,440 | 14.5 | 11.6 | Golden yellow, 60 per cent; dark brownish yellow, 40 per cent. |
| Do | A 7 R S 6 | .798 | .50 | 19,800 | 39,600 | 29.0 | 28.4 | Uniform light golden yellow. |
| Do | A 8 R S 6 | .798 | .50 | 19,470 | 38,940 | 38.0 | 31.6 | Do. |
| Do | A 9 R S 6 | .798 | .50 | 16,070 | 32,140 | 17.5 | 16.4 | Yellow and dark-brown metal interspersed. |
| Do | A 10 R S 6 | .798 | .50 | 17,500 | 35,000 | 20.0 | 20.8 | Uniform light golden yellow. |
| Do | A 13 R S 6 | .798 | .50 | 23,400 | 46,800 | 42.0 | 33.6 | Uniform light yellow. |
| Do | A 2 2 R S 6 | .798 | .50 | 8,340 | 16,680 | 10.0 | 6.8 | Golden yellow, irregular surface. Opened cracks along the stem. |
| Oscillating slide | A 1 O S 6 | .798 | .50 | 12,680 | 25,360 | 15.5 | 11.6 | Lavender yellow, with patches of dark golden yellow metal. |
| Do | A 2 O S 6 | .798 | .50 | 16,970 | 33,940 | 22.0 | 20.8 | Uniform light golden metal. |
| Do | A 5 O S 6 | .798 | .50 | 17,630 | 35,260 | 19.5 | 20.8 | Do. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Do | A 6 OS 6 | .798 | .50 | 16,210 | 32,420 | 17.0 | 16.4 | Light yellow with patches of dark-yellow and lavender-colored metal interspersed. |
| Do | A 7 OS 6 | .798 | .50 | 16,080 | 32,160 | 19.0 | 20.8 | Uniform light yellow. |
| Do | A 1 2 OS 6 | .505 | .20 | 5,870 | 29,350 | 20.0 | 20.5 | Light and golden yellow metal interspersed. Opened cracks along the stem. |
| Do | A 1 3 OS 6 | .564 | .25 | 5,210 | 20,840 | 11.0 | 8.4 | Dark copper colored, light and golden yellow metal interspersed. |
| Pivot yoke | A 2 P Y 6 | .798 | .50 | 16,610 | 33,220 | 22.0 | 18.6 | Greenish and golden-yellow metal interspersed. |
| Do | A 4 PY6 | .798 | .50 | 18,620 | 37,240 | 27.5 | 23.0 | Uniform light golden yellow. |
| Do | A 5 PY6 | .798 | .50 | 18,010 | 36,020 | 31.0 | 27.4 | Do. |
| Do | A 6 PY6 | .798 | .50 | 18,340 | 36,680 | 23.5 | 20.8 | Do. |
| Do | A 7 PY6 | .798 | .50 | 18,200 | 36,400 | 28.0 | 23.0 | Uniform golden yellow. |
| Do | A 8 PY6 | .798 | .50 | 16,120 | 32,240 | 19.0 | 16.4 | Do. |
| Do | A 10 PY6 | .798 | .50 | 18,680 | 37,360 | 31.0 | 27.4 | Uniform light golden yellow. |
| Do | A 11 PY6 | .798 | .50 | 24,060 | 48,120 | 43.5 | 33.6 | Uniform light yellow. |
| Trail spade | T S 1 | .798 | .50 | 24,420 | 48,840 | 28.0 | 31.6 | Uniform light-yellow color. |
| Do | T S 4 | .798 | .50 | 23,200 | 46,400 | 15.5 | 18.6 | Lavender yellow, with golden-yellow metal finely interspersed. |
| Do | T S 6 | .798 | .50 | 11,700 | 23,400 | 9.0 | 14.0 | Lavender yellow, with lemon-yellow metal on one side. Spongy spot at circumference. |
| Do | T S 6 | .798 | .50 | 13,910 | 27,820 | 6.0 | 11.6 | Lavender and lemon-yellow metal interspersed. |
| Do | T S 7 | .798 | .50 | 24,710 | 49,420 | 20.0 | 23.0 | Fine silky, lavender colored. |
| Do | T S 8 | .798 | .50 | 15,570 | 31,140 | 29.0 | 29.4 | Light-yellow and lavender-colored metal interspersed. |
| Do | T S 9 | .798 | .50 | 12,600 | 25,200 | 5.5 | 9.2 | Light lavender colored, with irregular sections of lemon-yellow metal. |
| Do | T S 10 | .798 | .50 | 21,980 | 43,960 | 13.5 | 23.0 | Fine silky, lavender colored. |
| Do | T S 2 | .798 | .50 | 14,100 | 28,200 | 7.0 | 9.2 | Light lavender, with streaks of yellow metal. |
| Trail head | T H 1 | .798 | .50 | 17,710 | 35,420 | 6.5 | 11.6 | Light yellowish lavender, dark spongy spot at circumference. |
| Do | T H 2 | .798 | .50 | 18,420 | 36,840 | 7.0 | 11.6 | Do. |
| Do | T H 3 | .798 | .50 | 23,310 | 46,620 | 12.5 | 18.6 | Light lavender, radiating from spot of yellow metal at center of bar. |
| Do | T H 4 | .798 | .50 | 15,120 | 30,240 | 5.0 | 6.8 | Light lavender, 60 per cent; dark-brown spongy, 40 per cent. |
| Recoil cylinder | R C 1 | .798 | .50 | 18,600 | 37,200 | 18.0 | 14.0 | Light lavender, with occasional spots of yellow metal. |

## Parson's Manganese Bronze, Recast from Ingot.

Castings made in Watertown Arsenal Foundry. Metal purchased of The Wm. Cramp & Sons Ship and Engine Building Company.

| Mark on specimen. | Diameter. | Sectional area. | Appproximate elastic limit. | | Ultimate strength. | | Elongation in 8 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total. | Per square inch. | Total. | Per square inch. | | | | | | |
| | *Inch.* | *Sq. inch.* | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inches.* | *Per cent.* | *In. Sq. in.* | *Per cent.* | | |
| Dry sand casting..... | .798 | .50 | 15,500 | 31,000 | 35,420 | 70,840 | .66 | 22.0 | Diam., .69 = .374 | 25.2 | Uniform light-yellow color.. | ".19, ".27*, ".20 |
| Green sand casting.... | .798 | .50 | 15,200 | 30,400 | 24,300 | 48,600 | .14 | 4.7 | Diam., .75 = .442 | 11.6 | Lavender colored, 60 per cent; lemon yellow, 40 per cent..... | .03, .09*, .02 |

## PARSON'S MANGANESE BRONZE.

Recast from ingot at Watertown arsenal.

No. 6319.

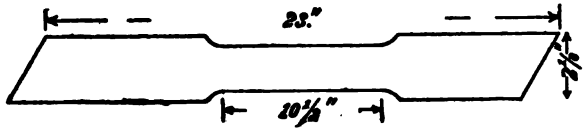
Diameter, 1″.105.
Sectional area, .959 square inch.
Gauged length, 10″.

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 959 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 4,795 | 5,000 | .00080 | .00080 | 0. | ..... | |
| 9,590 | 10,000 | .00068 | .00038 | —.00001 | —.00001 | |
| 14,385 | 15,000 | .00111 | .00043 | .00003 | .00004 | |
| 15,344 | 16,000 | .00130 | .00019 | ..... | ..... | |
| 16,303 | 17,000 | .00139 | .00009 | ..... | ..... | No well-defined elastic limit. |
| 17,262 | 18,000 | .00148 | .00009 | ..... | ..... | |
| 18,221 | 19,000 | .00160 | .00012 | ..... | ..... | |
| 19,180 | 20,000 | .00175 | .00015 | .00020 | .00017 | |
| 20,139 | 21,000 | .00188 | .00013 | ..... | ..... | |
| 21,098 | 22,000 | .00207 | .00019 | ..... | ..... | |
| 22,057 | 23,000 | .00221 | .00014 | ..... | ..... | |
| 23,016 | 24,000 | .00240 | .00019 | ..... | ..... | |
| 23,975 | 25,000 | .00260 | .00020 | .00052 | .00032 | |
| 24,934 | 26,000 | .00272 | .00012 | ..... | ..... | |
| 25,893 | 27,000 | .00300 | .00028 | ..... | ..... | |
| 26,852 | 28,000 | .00328 | .00028 | ..... | ..... | |
| 27,811 | 29,000 | .00358 | .00030 | ..... | ..... | |
| 28,770 | 30,000 | .00399 | .00041 | .00139 | .00087 | |
| 30,688 | 32,000 | .00479 | .00080 | ..... | ..... | |
| 32,606 | 34,000 | .00612 | .00133 | ..... | ..... | |
| 34,524 | 36,000 | .00803 | .00191 | ..... | ..... | |
| 36,442 | 38,000 | .01040 | .00237 | ..... | ..... | |
| 38,360 | 40,000 | .01385 | .00345 | .01012 | .00873 | |
| 40,278 | 42,000 | .01726 | .00341 | ..... | ..... | |
| 42,196 | 44,000 | .02280 | .00554 | ..... | ..... | |
| 44,114 | 46,000 | .02810 | .00530 | .02369 | .01357 | |
| 52,800 | 54,850 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 54,850 |
| Elastic limit per square inch of original section | | not well defined |
| Elongation per inch after rupture | inch.. | .0630 |
| Reduction in diameter at point of rupture | do... | .065 |
| Reduction in area after rupture, per cent of original section | | 11.5 |
| Position of rupture | | 4″.7 from neck |
| Character of broken surface | | light yellow, with patches of lemon-yellow metal interspersed |
| Elongation of inch sections | | ″.05, ″.06, ″.05, ″.05, ″.07, ″.09, ″.12*, ″.05, ″.04, ″.05 |

## CARTRIDGE BRASS.




| No. of test. | Mark on specimen. | Dimensions. | | Sectional area. | Elastic limit. | | Ultimate strength. | | Elongation in 10 inches. | | Area at fracture. | Contraction of area. | Appearance of fracture. | Elongation of inch sections. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Width. | Thickness. | | Total. | Per square inch. | Total. | Per square inch. | | | | | | |
| | | *Inches.* | *Inches.* | *Sq. inch.* | *Pounds* | *Pounds.* | *Pounds.* | *Pounds.* | *Inches.* | *Per ct.* | *In. In. Sq. in.* | *Per ct.* | | " " " " " " " " " " |
| 9619 | 35 | 1.498 | .1193 | .1787 | 2,750 | 15,390 | 8,140 | 45,550 | 5.82 | 58.2 | 1.04×.06=.0624 | 65.1 | Uniform silky. | .47, .49, .52, .56, .61, .58, .58, .89*, .58, .54 |
| 9620 | 36 | 1.498 | .1202 | .1800 | 2,480 | 13,780 | 8,030 | 44,610 | 5.89 | 58.9 | 1.04×.06=.0624 | 65.3 | do | .48, .53, .52, .52, .55, .59, .62, .92*, .63, .58 |
| 9621 | C | 1.500 | .1192 | .1788 | 2,720 | 15,210 | 8,320 | 46,530 | 6.12 | 61.2 | 1.03×.06=.0618 | 65.4 | do | .58, .56, .52, .57, .56, .92*, .66, .63, .63, .55 |
| 9622 | $C_1$ | 1.500 | .1182 | .1773 | 2,980 | 16,810 | 8,240 | 46,470 | 5.43 | 54.3 | 1.02×.07=.0714 | 59.7 | do | .46, .46, .46, .49, .54, .89*, .60, .53, .52, .48 |
| 9623 | $E_1$ | 1.498 | .1178 | .1765 | 2,960 | 16,770 | 8,310 | 47,080 | 6.29 | 62.9 | 1.04×.06=.0624 | 64.6 | do | .57, .58, .56, .59, .60, .62, .63, .63, .89*, .60 |
| 9624 | $C_2$ | 1.501 | .1185 | .1779 | 2,720 | 15,290 | 8,240 | 46,320 | 6.39 | 63.9 | 1.04×.06=.0624 | 64.9 | do | .54, .57, .57, .60, .59, .60, .86*, .72, .68, .66 |
| 9625 | $C_2$ | 1.500 | .1180 | .1770 | 2,900 | 16,380 | 8,430 | 47,630 | 6.15 | 61.5 | 1.07×.05=.0535 | 69.8 | do | .58, .55, .57, .60, .59, .58, .85*, .62, .62, .59 |
| 9626 | $E_2$ | 1.498 | .1188 | .1780 | 2,800 | 15,730 | 8,440 | 47,420 | 5.88 | 58.8 | 1.04×.05=.0520 | 70.8 | do | .48, .48, .49, .52, .53, .57, .68, .65, .86*, .67 |

# CAST COPPER.

METAL SUBMITTED BY C. L. LEIBY, KNOXVILLE, TENN., TO THE BOARD OF ORDNANCE AND FORTIFICATIONS.

## No. 5985.

Tagged, "medium hard copper."
Marked, E.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 500 | 2,000 | .000000 | .000000 | ..... | ..... | |
| 750 | 3,000 | .000050 | .000050 | ..... | ..... | |
| 1,000 | 4,000 | .000050 | 0. | ..... | ..... | |
| 1,250 | 5,000 | .000050 | 0. | ..... | ..... | |
| 1,500 | 6,000 | .000150 | .000100 | ..... | ..... | |
| 1,750 | 7,000 | .000250 | .000100 | ..... | ..... | Elastic limit. |
| 2,000 | 8,000 | .000450 | .000200 | ..... | ..... | |
| 2,250 | 9,000 | .000800 | .000350 | ..... | ..... | |
| 2,500 | 10,000 | .001500 | .000700 | .000900 | .000900 | |
| 2,750 | 11,000 | .002450 | .000950 | ..... | ..... | |
| 3,000 | 12,000 | .005950 | .003500 | ..... | ..... | |
| 3,250 | 13,000 | .009550 | .003600 | ..... | ..... | |
| 3,500 | 14,000 | .018250 | .008700 | ..... | ..... | |
| 3,750 | 15,000 | .023500 | .005250 | ..... | ..... | |
| 4,000 | 16,000 | .033250 | .009750 | ..... | ..... | |
| 4,250 | 17,000 | .038700 | .005450 | ..... | ..... | |
| 4,500 | 18,000 | .050000 | .011300 | ..... | ..... | |
| 4,620 | 18,480 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 18,480 |
| Elastic limit per square inch of original section | do... | 7,000 |
| Elongation per inch after rupture | inch.. | .0850 |
| Elongation per inch under strain at elastic limit | do... | .000250 |
| Reduction in diameter at point of rupture | do... | .034 |
| Reduction in area after rupture, per cent of original section | | 11.8 |
| Position of rupture | | ".50 from neck |
| Character of broken surface | | dull brownish-yellow 90 per cent, spongy 10 per cent. Blow holes were found along the length of the specimen. |
| Elongation of inch sections | | ".04, ".13* |

Hardness determination: Pressure of 7,350 pounds on indenting tool made cut in copper 1 inch long.

No. 5986.

Tagged, "hard copper."
Marked F.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 2".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 250 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 500 | 2,000 | .000050 | .000050 | ..... | ..... | |
| 750 | 3,000 | .000050 | 0. | ..... | ..... | |
| 1,000 | 4,000 | .000150 | .000100 | ..... | ..... | Elastic limit. |
| 1,250 | 5,000 | .000850 | .000200 | ..... | ..... | |
| 1,500 | 6,000 | .000500 | .000150 | ..... | ..... | |
| 1,750 | 7,000 | .000550 | .000050 | ..... | ..... | |
| 2,000 | 8,000 | .001000 | .000450 | ..... | ..... | |
| 2,250 | 9,000 | .001600 | .000600 | ..... | ..... | |
| 2,500 | 10,000 | .003750 | .002150 | .003000 | .003000 | |
| 2,750 | 11,000 | .007050 | .003300 | ..... | ..... | |
| 3,000 | 12,000 | .013000 | .005950 | ..... | ..... | |
| 3,250 | 13,000 | .019000 | .006000 | ..... | ..... | |
| 3,500 | 14,000 | .030000 | .011000 | ..... | ..... | |
| 3,750 | 15,000 | .035750 | .005750 | ..... | ..... | |
| 4,000 | 16,000 | .047750 | .012000 | ..... | ..... | |
| 4,250 | 17,000 | .056500 | .008750 | ..... | ..... | |
| 4,500 | 18,000 | .072250 | .015750 | ..... | ..... | |
| 4,610 | 18,440 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

| | | |
|---|---|---|
| Tensile strength per square inch of original section | pounds.. | 18,440 |
| Elastic limit per square inch of original section | do... | 4,000 |
| Elongation per inch after rupture | inch.. | .0950 |
| Elongation per inch under strain at elastic limit | do... | .000150 |
| Reduction in diameter at point of rupture | do... | .034 |
| Reduction in area after rupture, per cent of original section | | 11.8 |
| Position of rupture | | ".4 from neck |
| Character of broken surface | | brownish-yellow 60 per cent, spongy 40 per cent |
| Elongation of inch sections | | ".13*, ".06 |

Hardness determination: Pressure of 7,540 pounds on indenting tool made cut in copper 1 inch long.

The standard pressure on indenting tool is 10,000; these specimens yielding the full length of cut of the tool at lower pressures are therefore softer than the initial point in the scale of hardness for iron and steel.

# COPPER CYLINDERS FOR PRESSURE GAUGES.

Mean compression of 10 copper cylinders from lot of 100 received from Frankford Arsenal May 9, 1899. Metal of September, 1896.
Table for use with crusher gauge one-thirtieth square inch area.
Mean dimensions of cylinders: Length, ".4990; diameter, ".2050.

| Load per square inch on crusher gauge $\frac{1}{30}$ square inch area. | Total compressions. | | | | | | | | | | | Mean corrected sets. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | Mean. | |
| *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 3,000 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 6,000 | .0003 | .0005 | .0008 | .0005 | .0006 | .0008 | .0008 | .0005 | .0002 | .0006 | .0005 | .0005 |
| 9,000 | .0012 | .0012 | .0016 | .0012 | .0014 | .0005 | .0018 | .0012 | .0007 | .0016 | .0012 | .0011 |
| 10,000 | .0016 | .0018 | .0022 | .0015 | .0017 | .0006 | .0028 | .0016 | .0015 | .0024 | .0018 | .0017 |
| 11,000 | .0031 | .0030 | .0033 | .0020 | .0025 | .0009 | .0037 | .0023 | .0028 | .0037 | .0027 | .0026 |
| 12,000 | .0046 | .0042 | .0043 | .0033 | .0036 | .0025 | .0058 | .0035 | .0042 | .0050 | .0041 | .0040 |
| 13,000 | .0066 | .0057 | .0057 | .0049 | .0042 | .0043 | .0070 | .0053 | .0059 | .0069 | .0057 | .0056 |
| 14,000 | .0079 | .0075 | .0075 | .0063 | .0059 | .0060 | .0095 | .0072 | .0074 | .0085 | .0074 | .0072 |
| 15,000 | .0097 | .0093 | .0093 | .0085 | .0075 | .0080 | .0108 | .0085 | .0095 | .0105 | .0091 | .0089 |
| 16,000 | .0115 | .0110 | .0110 | .0100 | .0091 | .0092 | .0126 | .0105 | .0110 | .0115 | .0107 | .0104 |
| 17,000 | .0134 | .0127 | .0125 | .0117 | .0110 | .0115 | .0142 | .0120 | .0130 | .0138 | .0126 | .0122 |
| 18,000 | .0155 | .0145 | .0142 | .0134 | .0130 | .0131 | .0164 | .0140 | .0145 | .0154 | .0144 | .0140 |
| 19,000 | .0168 | .0165 | .0163 | .0150 | .0144 | .0152 | .0177 | .0156 | .0165 | .0171 | .0161 | .0157 |
| 20,000 | .0191 | .0185 | .0189 | .0165 | .0172 | .0170 | .0205 | .0179 | .0187 | .0195 | .0184 | .0179 |
| 21,000 | .0209 | .0200 | .0204 | .0197 | .0183 | .0191 | .0217 | .0197 | .0207 | .0207 | .0201 | .0196 |
| 22,000 | .0225 | .0223 | .0225 | .0210 | .0205 | .0207 | .0245 | .0220 | .0223 | .0232 | .0222 | .0217 |
| 23,000 | .0252 | .0241 | .0241 | .0225 | .0225 | .0231 | .0257 | .0255 | .0253 | .0263 | .0244 | .0238 |
| 24,000 | .0268 | .0260 | .0265 | .0252 | .0244 | .0248 | .0280 | .0261 | .0267 | .0270 | .0262 | .0256 |
| 25,000 | .0289 | .0278 | .0275 | .0265 | .0263 | .0270 | .0304 | .0275 | .0282 | .0295 | .0280 | .0273 |
| 26,000 | .0315 | .0300 | .0296 | .0289 | .0281 | .0294 | .0329 | .0301 | .0310 | .0330 | .0304 | .0297 |
| 27,000 | .0335 | .0324 | .0324 | .0315 | .0307 | .0311 | .0344 | .0318 | .0328 | .0335 | .0324 | .0316 |
| 28,000 | .0348 | .0340 | .0344 | .0335 | .0326 | .0335 | .0367 | .0345 | .0354 | .0354 | .0345 | .0337 |
| 29,000 | .0370 | .0359 | .0366 | .0351 | .0348 | .0353 | .0391 | .0370 | .0369 | .0375 | .0365 | .0356 |
| 30,000 | .0393 | .0386 | .0386 | .0371 | .0379 | .0375 | .0424 | .0380 | .0392 | .0403 | .0389 | .0379 |
| 31,000 | .0417 | .0414 | .0409 | .0400 | .0395 | .0400 | .0432 | .0408 | .0415 | .0424 | .0411 | .0401 |
| 32,000 | .0440 | .0430 | .0428 | .0424 | .0420 | .0430 | .0462 | .0430 | .0440 | .0442 | .0435 | .0425 |
| 33,000 | .0465 | .0443 | .0459 | .0455 | .0442 | .0446 | .0483 | .0464 | .0460 | .0475 | .0459 | .0449 |
| 34,000 | .0479 | .0468 | .0474 | .0471 | .0458 | .0466 | .0500 | .0479 | .0480 | .0489 | .0476 | .0465 |
| 35,000 | .0505 | .0496 | .0511 | .0487 | .0480 | .0492 | .0527 | .0492 | .0507 | .0517 | .0501 | .0490 |
| 36,000 | .0530 | .0519 | .0518 | .0510 | .0511 | .0509 | .0542 | .0520 | .0535 | .0537 | .0523 | .0512 |
| 37,000 | .0547 | .0535 | .0540 | .0540 | .0530 | .0531 | .0572 | .0540 | .0550 | .0563 | .0545 | .0534 |
| 38,000 | .0570 | .0560 | .0565 | .0555 | .0550 | .0569 | .0595 | .0570 | .0576 | .0581 | .0569 | .0558 |
| 39,000 | .0596 | .0587 | .0588 | .0570 | .0575 | .0586 | .0622 | .0594 | .0597 | .0609 | .0592 | .0581 |
| 40,000 | .0611 | .0614 | .0613 | .0605 | .0590 | .0608 | .0636 | .0610 | .0621 | .0632 | .0614 | .0603 |
| 41,000 | .0645 | .0635 | .0639 | .0637 | .0620 | .0630 | .0670 | .0640 | .0658 | .0653 | .0643 | .0632 |
| 42,000 | .0661 | .0657 | .0662 | .0650 | .0640 | .0650 | .0694 | .0665 | .0675 | .0680 | .0663 | .0652 |
| 43,000 | .0684 | .0682 | .0690 | .0675 | .0675 | .0670 | .0712 | .0681 | .0691 | .0694 | .0685 | .0674 |
| 44,000 | .0722 | .0704 | .0714 | .0695 | .0693 | .0698 | .0740 | .0711 | .0726 | .0732 | .0713 | .0702 |
| 45,000 | .0744 | .0721 | .0731 | .0731 | .0721 | .0733 | .0769 | .0745 | .0755 | .0749 | .0740 | .0729 |
| 46,000 | .0762 | .0755 | .0771 | .0755 | .0748 | .0745 | .0785 | .0764 | .0765 | .0768 | .0762 | .0751 |
| 47,000 | .0788 | .0780 | .0793 | .0769 | .0772 | .0773 | .0807 | .0800 | .0784 | .0790 | .0786 | .0774 |
| 48,000 | .0834 | .0805 | .0820 | .0795 | .0797 | .0805 | .0845 | .0825 | .0828 | .0828 | .0818 | .0806 |
| 49,000 | .0840 | .0828 | .0841 | .0830 | .0829 | .0826 | .0870 | .0840 | .0852 | .0845 | .0840 | .0828 |
| 50,000 | .0870 | .0860 | .0875 | .0853 | .0852 | .0858 | .0896 | .0866 | .0875 | .0880 | .0868 | .0856 |
| 51,000 | .0914 | .0892 | .0900 | .0882 | .0880 | .0873 | .0917 | .0896 | .0905 | .0904 | .0896 | .0884 |
| 52,000 | .0925 | .0910 | .0920 | .0905 | .0906 | .0905 | .0940 | .0917 | .0924 | .0929 | .0918 | .0906 |
| 53,000 | .0948 | .0935 | .0960 | .0932 | .0940 | .0934 | .0975 | .0940 | .0952 | .0962 | .0947 | .0935 |
| 54,000 | .0962 | .0962 | .0979 | .0968 | .0960 | .0965 | .1005 | .0986 | .0980 | .0981 | .0977 | .0965 |
| 55,000 | .1014 | .0986 | .1002 | .0985 | .0988 | .0985 | .1020 | .0997 | .1006 | .1005 | .0999 | .0987 |
| 56,000 | .1029 | .1010 | .1038 | .1011 | .1022 | .1012 | .1058 | .1030 | .1041 | .1032 | .1028 | .1016 |
| 57,000 | .1064 | .1048 | .1066 | .1036 | .1050 | .1049 | .1082 | .1060 | .1060 | .1057 | .1057 | .1045 |
| 58,000 | .1095 | .1074 | .1083 | .1072 | .1072 | .1074 | .1110 | .1081 | .1090 | .1088 | .1084 | .1072 |
| 59,000 | .1109 | .1090 | .1119 | .1112 | .1100 | .1100 | .1130 | .1114 | .1109 | .1120 | .1110 | .1097 |
| 60,000 | .1137 | .1128 | .1140 | .1124 | .1129 | .1129 | .1175 | .1140 | .1140 | .1144 | .1139 | .1126 |
| 61,000 | .1172 | .1180 | .1178 | .1145 | .1150 | .1149 | .1200 | .1160 | .1166 | .1170 | .1167 | .1154 |
| 62,000 | .1199 | .1190 | .1204 | .1187 | .1184 | .1178 | .1210 | .1194 | .1195 | .1190 | .1193 | .1180 |
| 63,000 | .1223 | .1209 | .1225 | .1209 | .1206 | .1213 | .1242 | .1223 | .1225 | .1216 | .1219 | .1206 |
| 64,000 | .1252 | .1235 | .1249 | .1244 | .1228 | .1237 | .1271 | .1238 | .1250 | .1243 | .1245 | .1232 |
| 65,000 | .1279 | .1264 | .1270 | .1257 | .1259 | .1264 | .1305 | .1274 | .1274 | .1266 | .1271 | .1258 |
| 66,000 | .1306 | .1295 | .1296 | .1290 | .1296 | .1298 | .1330 | .1304 | .1310 | .1305 | .1303 | .1290 |
| 67,000 | .1329 | .1320 | .1328 | .1312 | .1320 | .1314 | .1352 | .1323 | .1326 | .1332 | .1326 | .1313 |
| 68,000 | .1355 | .1346 | .1358 | .1345 | .1359 | .1346 | .1384 | .1356 | .1355 | .1360 | .1356 | .1342 |
| 69,000 | .1397 | .1380 | .1387 | .1376 | .1376 | .1375 | .1417 | .1381 | .1387 | .1380 | .1386 | .1372 |
| 70,000 | .1432 | .1394 | .1409 | .1393 | .1405 | .1401 | .1431 | .1400 | .1406 | .1407 | .1408 | .1394 |
| 71,000 | .1449 | .1433 | .1448 | .1433 | .1435 | .1424 | .1460 | .1435 | .1434 | .1445 | .1440 | .1426 |
| 72,000 | .1480 | .1463 | .1470 | .1456 | .1458 | .1457 | .1494 | .1459 | .1464 | .1468 | .1467 | .1453 |
| 73,000 | .1500 | .1480 | .1496 | .1476 | .1488 | .1486 | .1514 | .1481 | .1480 | .1488 | .1489 | .1475 |

| Load per square inch on crusher gauge $\frac{1}{10}$ square inch area. | Total compressions. | | | | | | | | | | | Mean corrected sets. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | Mean. | |
| *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 74,000 | .1525 | .1510 | .1520 | .1505 | .1515 | .1511 | .1539 | .1525 | .1525 | .1523 | .1520 | .1506 |
| 75,000 | .1549 | .1534 | .1560 | .1539 | .1584 | .1537 | .1584 | .1545 | .1562 | .1549 | .1549 | .1535 |
| 76,000 | .1588 | .1565 | .1580 | .1552 | .1569 | .1560 | .1608 | .1561 | .1575 | .1570 | .1573 | .1559 |
| 77,000 | .1615 | .1587 | .1605 | .1585 | .1591 | .1595 | .1631 | .1595 | .1597 | .1595 | .1600 | .1586 |
| 78,000 | .1635 | .1630 | .1634 | .1615 | .1618 | .1613 | .1652 | .1625 | .1620 | .1625 | .1627 | .1613 |
| 79,000 | .1673 | .1645 | .1660 | .1637 | .1647 | .1644 | .1676 | .1657 | .1653 | .1650 | .1654 | .1640 |
| 80,000 | .1698 | .1670 | .1689 | .1664 | .1670 | .1672 | .1703 | .1677 | .1686 | .1672 | .1680 | .1666 |
| 81,000 | .1713 | .1695 | .1710 | .1696 | .1710 | .1694 | .1728 | .1700 | .1705 | .1700 | .1705 | .1691 |
| 82,000 | .1748 | .1719 | .1724 | .1713 | .1721 | .1721 | .1751 | .1732 | .1730 | .1735 | .1729 | .1715 |
| 83,000 | .1779 | .1747 | .1750 | .1749 | .1755 | .1748 | .1784 | .1749 | .1765 | .1768 | .1759 | .1745 |
| 84,000 | .1805 | .1775 | .1778 | .1775 | .1784 | .1769 | .1810 | .1775 | .1780 | .1785 | .1784 | .1770 |
| 85,000 | .1821 | .1800 | .1805 | .1790 | .1800 | .1800 | .1832 | .1800 | .1795 | .1808 | .1805 | .1791 |
| 86,000 | .1845 | .1823 | .1825 | .1826 | .1828 | .1831 | .1854 | .1823 | .1820 | .1835 | .1831 | .1817 |
| 87,000 | .1877 | .1859 | .1860 | .1850 | .1855 | .1853 | .1876 | .1863 | .1850 | .1864 | .1861 | .1847 |
| 88,000 | .1898 | .1875 | .1880 | .1873 | .1874 | .1877 | .1898 | .1880 | .1870 | .1890 | .1881 | .1867 |
| 89,000 | .1924 | .1900 | .1915 | .1898 | .1903 | .1902 | .1925 | .1902 | .1896 | .1900 | .1906 | .1892 |
| 90,000 | .1962 | .1937 | .1935 | .1928 | .1926 | .1920 | .1949 | .1925 | .1921 | .1930 | .1933 | .1919 |
| 91,000 | .1978 | .1958 | .1950 | .1947 | .1955 | .1942 | .1974 | .1945 | .1946 | .1960 | .1956 | .1942 |
| 92,000 | .1996 | .1977 | .1990 | .1975 | .1981 | .1985 | .1993 | .1969 | .1983 | .1976 | .1982 | .1968 |
| 93,000 | .2018 | .2001 | .2010 | .1995 | .2005 | .2007 | .2024 | .1991 | .2000 | .2012 | .2006 | .1992 |
| 94,000 | .2051 | .2024 | .2025 | .2030 | .2043 | .2026 | .2044 | .2021 | .2025 | .2027 | .2032 | .2018 |
| 95,000 | .2070 | .2053 | .2057 | .2050 | .2060 | .2049 | .2060 | .2044 | .2044 | .2050 | .2054 | .2040 |
| 96,000 | .2088 | .2069 | .2077 | .2064 | .2077 | .2070 | .2086 | .2065 | .2065 | .2071 | .2073 | .2059 |
| 97,000 | .2125 | .2095 | .2095 | .2081 | .2100 | .2093 | .2112 | .2068 | .2089 | .2098 | .2098 | .2084 |
| 98,000 | .2149 | .2119 | .2120 | .2105 | .2125 | .2115 | .2128 | .2117 | .2110 | .2125 | .2121 | .2107 |
| 99,000 | .2170 | .2142 | .2143 | .2130 | .2150 | .2138 | .2160 | .2140 | .2143 | .2150 | .2147 | .2133 |
| 100,000 | .2192 | .2165 | .2169 | .2156 | .2165 | .2164 | .2184 | .2158 | .2159 | .2164 | .2168 | .2154 |

## "LUMEN" METAL.

Metal submitted by Bierbaum & Merrick, Cincinnati, Ohio.

TENSION TEST.

No. 6368.

Diameter, 1".129.
Sectional area, 1.00 square inch.
Gauged length, 4".

| Applied loads. | | Elongation per inch. | Successive elongation per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 2,000 | 2,000 | .000075 | .000075 | ..... | ..... | |
| 3,000 | 3,000 | .000150 | .000075 | ..... | ..... | |
| 4,000 | 4,000 | .000225 | .000075 | ..... | ..... | |
| 5,000 | 5,000 | .000325 | .000100 | ..... | ..... | |
| 6,000 | 6,000 | .000400 | .000075 | ..... | ..... | |
| 7,000 | 7,000 | .000500 | .000100 | ..... | ..... | |
| 8,000 | 8,000 | .000575 | .000075 | ..... | ..... | |
| 9,000 | 9,000 | .000650 | .000075 | ..... | ..... | |
| 10,000 | 10,000 | .000750 | .000100 | .000050 | .000050 | |
| 11,000 | 11,000 | .000850 | .000100 | ..... | ..... | |
| 12,000 | 12,000 | .000975 | .000125 | ..... | ..... | |
| 13,000 | 13,000 | .001075 | .000100 | ..... | ..... | |
| 14,000 | 14,000 | .001175 | .000100 | ..... | ..... | |
| 15,000 | 15,000 | .001300 | .000125 | .000200 | .000150 | |
| 16,000 | 16,000 | .001425 | .000125 | ..... | ..... | |
| 17,000 | 17,000 | .001575 | .000150 | ..... | ..... | |
| 18,000 | 18,000 | .001750 | .000175 | ..... | ..... | |
| 19,000 | 19,000 | .001900 | .000150 | ..... | ..... | |
| 20,000 | 20,000 | .002075 | .000175 | .000525 | .000325 | |
| 20,300 | 20,300 | ..... | ..... | ..... | ..... | Tensile strength. |

*General summary.*

Tensile strength per square inch of original section ..... pounds.. 20,300
Elongation per inch after rupture ..... inch.. .0050
Reduction in area after rupture, per cent of original section ..... not appreciable
Position of rupture ..... ".85 from neck
Character of broken surface.... dull amorphous, silvery luster, interspersed with bright granulation
Elongation of inch sections ..... ".02*, ".00, ".00, ".00

## LUMEN METAL.

### COMPRESSION TEST.

Specimen taken from stem of tensile specimen.

No. 1167.

Length, 4″.
Diameter, 1″.129.
Sectional area, 1.00 square inch.
Gauged length, 3″.

| Applied loads. | | Compression per inch. | Successive compression per inch. | Permanent set. | Successive permanent set. | Remarks. |
|---|---|---|---|---|---|---|
| Total. | Per square inch. | | | | | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | |
| 1,000 | 1,000 | 0. | 0. | 0. | 0. | Initial load. |
| 5,000 | 5,000 | .000333 | .000333 | 0. | ..... | |
| 10,000 | 10,000 | .000833 | .000500 | .000100 | .000100 | |
| 11,000 | 11,000 | .000933 | .000100 | ..... | ..... | |
| 12,000 | 12,000 | .001033 | .000100 | ..... | ..... | |
| 13,000 | 13,000 | .001200 | .000167 | ..... | ..... | |
| 14,000 | 14,000 | .001333 | .000133 | ..... | ..... | |
| 15,000 | 15,000 | .001467 | .000134 | .000400 | .000300 | |
| 16,000 | 16,000 | .001600 | .000133 | ..... | ..... | |
| 17,000 | 17,000 | .001700 | .000100 | ..... | ..... | |
| 18,000 | 18,000 | .001900 | .000200 | ..... | ..... | |
| 19,000 | 19,000 | .002100 | .000200 | ..... | ..... | |
| 20,000 | 20,000 | .002333 | .000233 | .000867 | .000467 | |
| 21,000 | 21,000 | .002500 | .000167 | ..... | ..... | |
| 22,000 | 22,000 | .002667 | .000167 | ..... | ..... | |
| 23,000 | 23,000 | .002967 | .000300 | ..... | ..... | |
| 24,000 | 24,000 | .003200 | .000233 | ..... | ..... | |
| 25,000 | 25,000 | .003500 | .000300 | .001600 | .000733 | |
| 26,000 | 26,000 | .003767 | .000267 | ..... | ..... | |
| 27,000 | 27,000 | .004200 | .000433 | ..... | ..... | |
| 28,000 | 28,000 | .004533 | .000333 | ..... | ..... | |
| 29,000 | 29,000 | .004867 | .000334 | ..... | ..... | |
| 30,000 | 30,000 | .005367 | .000500 | .003033 | .001433 | |
| 32,000 | 32,000 | .006467 | .001100 | ..... | ..... | |
| 34,000 | 34,000 | .007967 | .001500 | ..... | ..... | |
| 36,000 | 36,000 | .009600 | .001633 | ..... | ..... | |
| 38,000 | 38,000 | .011833 | .002233 | ..... | ..... | |
| 40,000 | 40,000 | .014933 | .003100 | .011867 | .008834 | |
| 77,600 | 77,600 | ..... | ..... | ..... | ..... | Tensile strength. |

Deflected laterally, and sheared at one end.

# CONCRETE AND MORTAR TESTS.

# CONCRETE CUBES

FROM

## BOSTON ELEVATED RAILWAY COMPANY.

717

*STATEMENT BY GEORGE A. KIMBALL, CHIEF ENGINEER BOSTON ELEVATED RAILWAY COMPANY, OF THE CONDITIONS OF MAKING AND STORING THE CONCRETE CUBES SENT TO THE ARSENAL, AND WHICH WERE TESTED FROM DECEMBER, 1898, TO JULY, 1899.*

MATERIALS USED.

*Sand.*—Coarse, clean, and sharp.
Voids measured loose and moist = 33 per cent.
Voids measured after settling by saturation with water = 25 per cent.
*Broken stone.*—Conglomerate from Roxbury, Mass.
Voids measured loose = 49.5 per cent.

*Size of stone.*

| Passed. | Retained by— | Per cent by weight. |
|---|---|---|
| 2½″ ring ..... | 2″ ring.... | 4.8 |
| 2″ ring ..... | 1″ ring.... | 76.7 |
| 1″ ring ..... | ¼″ ring.... | 18.0 |
| ¼″ ring ..... | ..... | 0.5 |
| Total .... | ..... | 100.0 |

METHOD OF MIXING.

Sand and cement turned twice dry in a mortar box, then enough water mixed in to give the mortar about the consistency of damp sand. Mortar then spread evenly over the stone, which has previously been spread on a mortar platform and drenched with water. Mortar and stone then turned twice, and concrete rammed into the molds with iron rammers and tamping bars. On completing ramming, water barely flushed to the surface of the 1:0:2 and 1:2:4 mixtures, while the surface of the 1:3:6 and 1:6:12 mixtures merely appeared moist. The concrete was what would ordinarily be termed dry.

As most of the mixing was done in weather a little above or below the freezing point there were frequently frozen lumps in the sand. When such was the case, or when the temperature required it, the sand was heated. On this account the percentage of water used for the same mixture with different brands of cement varied considerably.

Owing to the cold weather the set of the concrete was slow, and the cubes were left in the molds from two to seven days in a room the temperature of which was usually about 40°, but which varied from 28° to 50°, and twice fell as low as 20°. When the temperature dropped below 32°, the concrete was protected from freezing by a covering of damp burlap.

After removal from the molds the blocks, except those tested at seven days, were buried in wet ground and left there till about a week before crushing. Some of the six months' cubes were, however, dug up about a month or six weeks before testing, when they were sent to the arsenal. The blocks were sent to the arsenal just as they were taken out of the molds or the ground, no patching or plastering of voids or broken corners being allowed. The mixing gang was one which had been at work making concrete for the foundations for the elevated structure, and the endeavor was to make concrete as nearly as possible like that which goes into actual construction work.

Detailed information as to the making and storing of each mixture of each brand of cement is given in tabular form below. The proportions of concrete given, 1:2:4, e. g., represent, respectively, parts by volume of cement, sand, and broken stone:

| | Water used—per cent by weight of cement. | Days in molds. | Days in wet ground. | | | | Temperature when made. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | Seven-day cubes. | Thirty-day cubes. | Three-month cubes. | Six-month cubes. | Mixing room. | Storing room. | |
| *Saylor's, made Dec. 7, 1898.* | | | | | | | | | |
| 1:2: 4 | 26.6 | 2 | 8 | 25 | 84 | 180 | ° *F.* 57 | ° *F.* 37 | Sand not heated; moist. |
| 1:3: 6 | 32.6 | | | | | | | | |
| 1:6:12 | 52.0 | | | | | | | | |
| *Atlas, made Dec. 12, 1898.* | | | | | | | | | |
| 1:2: 4 | 31.2 | 3 | 2 | 23 | 84 | 174 | 26–31 | 36 | Sand heated; dry. |
| 1:3: 6 | 39.1 | | | | | | | | |
| 1:6:12 | 65.6 | | | | | | | | |
| *Alpha, made Dec. 16, 1898.* | | | | | | | | | |
| 1:0: 2 | 21.3 | 6 | 0 | 20 | 79 | 170 | 30–35 | 40 | Sand heated; dry. Stone heated for 1:0:2 mixture. |
| 1:2: 4 | 39.8 | | | | | | | | |
| 1:3: 6 | 46.8 | | | | | | | | |
| 1:6:12 | 77.7 | | | | | | | | |
| *Alpha, made Jan. 26, 1899.* | | | | | | | | | |
| 1:0: 2 | 15.5 | 7 | | | 82 | 128 | 22–27 | 32 | Sand heated; stone heated for 1:0:2 mixture. |
| 1:2: 4 | 23.8 | | | | | | | | |
| *Germania, made Dec. 23, 1898.* | | | | | | | | | |
| 1:0: 2 | 21.5 | 4 | 0 | 23 | 83 | 165 | 34–39 | 44 | Sand heated; dry. Stone not heated. |
| 1:2: 4 | 35.0 | | | | | | | | |
| 1:3: 6 | 37.7 | | | | | | | | |
| 1:6:12 | 66.5 | | | | | | | | |
| *Germania, made Dec. 27, 1898.* | | | | | | | | | |
| 1:0: 2 | 23.5 | 1 | | 22 | 82 | | 30–35 | 40 | |
| *Germania, made Jan. 26, 1899.* | | | | | | | | | |
| 1:0: 2 | 15.8 | 7 | | | | 128 | 22–27 | 32 | Sand heated; stone heated for 1:0:2 mixture. |
| 1:2: 4 | 22.1 | | | | | | | | |
| *Alsen, made Dec. 30, 1898.* | | | | | | | | | |
| 1:0: 2 | 26.8 | 4 | 0 | 22 | 88 | 158 | 40 | 50 | Sand heated; dry. Stone not heated. |
| 1:2: 4 | 39.7 | | | | | | | | |
| 1:3: 6 | 40.2 | | | | | | | | |
| 1:6:12 | 93.7 | | | | | | | | |
| *Alsen, made Jan. 26, 1899.* | | | | | | | | | |
| 1:2: 4 | 24.1 | 7 | | | 82 | 128 | 22–27 | 32 | Sand heated. |
| *Alsen, made Feb. 4, 1899.* | | | | | | | | | |
| 1:0: 2 | 22.0 | 9 | | | | 117 | 29–32 | | |

It will be seen from the above table that the average amount of water used with the different mixtures was in per cent by weight of cement as follows:

Mixture 1:0: 2 ..... 20.9
Mixture 1:2: 4 ..... 30.3
Mixture 1:3: 6 ..... 39.3
Mixture 1:6:12 ..... 71.1

This amount of water given includes only that mixed with the mortar; it does not include that used in wetting the stone.

The 1:6:12 blocks were in poor condition. This was due to the difficulty of getting so lean a mixture well rammed into the corners of molds so small as 12″, and to the fact that the concrete had not attained sufficient strength, even though handled with care, to hold together well in the process of removal from the molds. The cubes of this mixture should have had a longer time to set before taking them out of the forms. In our foundation work we have used this mixture only as a filling with which to replace soft ground and on which to build the foundations proper.

CONCRETE CUBES MADE OF GERMANIA PORTLAND CEMENT—Continued.

| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds* | *Pounds.* | |
| D 22 | 1 | 6 | 12 | 1 | ..... | 144 | 12 | ..... | 12.56 | 12.16 | 11.85 | 144.10 | 144,000 | 166,000 | 1,152 | Corners gone. |
| 27 | ..... | ..... | ..... | 1 | ..... | 137 | 12 | ..... | 12.33 | 12.15 | 11.90 | 144.59 | 119,900 | 125,000 | 864 | Corners gone; voids. |
| 28 | ..... | ..... | ..... | 1 | ..... | 145 | 12 | ..... | 12.45 | 11.99 | 12.12 | 145.32 | 165,500 | 178,500 | 1,228 | Do. |
| 31 | ..... | ..... | ..... | 1 | ..... | 139 | 8 | ..... | 12.20 | 12.15 | 11.90 | 144.59 | 144,590 | 157,300 | 1,088 | Do. |
| 32 | ..... | ..... | ..... | 1 | ..... | 133 | 0 | ..... | 12.28 | 12.13 | 11.98 | 145.32 | 108,000 | 124,000 | 853 | Corners gone and part of each surface. |
| 33 | ..... | ..... | ..... | 1 | ..... | 137 | 0 | ..... | 12.21 | 12.04 | 12.08 | 145.44 | 107,200 | 107,200 | 737 | Corners gone; defective end surface. |
| D 23 | 1 | 6 | 12 | 3 | ..... | 148 | 4 | 141.82 | 12.42 | 12.14 | 11.98 | 145.44 | 184,500 | 184,500 | 1,269 | Voids. |
| 25 | ..... | ..... | ..... | 3 | ..... | 147 | 4 | ..... | 12.49 | 12.04 | 11.85 | 142.67 | 182,000 | 182,000 | 1,276 | Corner gone. |
| 26 | ..... | ..... | ..... | 3 | ..... | 149 | 4 | ..... | 12.56 | 11.96 | 12.12 | 144.96 | 159,000 | 179,000 | 1,235 | Corners gone. |
| 36 | ..... | ..... | ..... | 3 | ..... | 116 | 4 | ..... | 12.15 | 12.07 | 12.00 | 144.84 | 83,200 | 83,200 | 574 | Corners gone; voids. |
| 38 | ..... | ..... | ..... | 3 | ..... | 128 | 8 | ..... | 12.28 | 11.88 | 12.06 | 143.27 | 102,000 | 104,100 | 727 | Voids. |
| 39 | ..... | ..... | ..... | 3 | ..... | 129 | 4 | ..... | 12.20 | 11.92 | 12.05 | 143.64 | 100,100 | 100,100 | 697 | Do. |
| D 37 | 1 | 6 | 12 | 6 | ..... | 129 | 0 | ..... | 12.34 | 12.00 | 12.11 | 145.32 | 121,200 | 121,200 | 834 | Corners gone; voids. |
| 40 | ..... | ..... | ..... | 6 | ..... | 132 | 8 | ..... | 12.23 | 11.99 | 11.81 | 141.60 | 142,000 | 155,300 | 1,097 | Voids. |
| 41 | ..... | ..... | ..... | 6 | ..... | 127 | 4 | ..... | 12.12 | 12.03 | 11.87 | 142.80 | 115,000 | 120,700 | 845 | Voids and corners gone. |
| 42 | ..... | ..... | ..... | 6 | ..... | 120 | 4 | ..... | 12.06 | 12.00 | 12.04 | 144.48 | 70,200 | 70,200 | 486 | Voids; 40 per cent of bearing surface at one end gone. |
| D 89 | 1 | 6 | 12 | 7 | ..... | 119 | 0 | ..... | 12.35 | 11.95 | 11.94 | 142.68 | 57,000 | 57,000 | 399 | About 60 per cent of one bearing surface gone. |
| 90 | ..... | ..... | ..... | 7 | ..... | 121 | 0 | ..... | 12.32 | 11.97 | 12.02 | 143.88 | 54,600 | 54,600 | 379 | About 40 per cent of one bearing surface gone. |

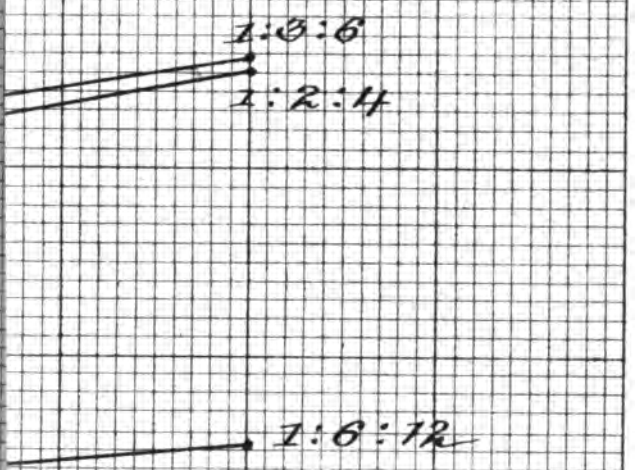
CONCRETE CUBES MADE OF ALSEN'S PORTLAND CEMENT.

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 69 | 1 | 0 | 2 | ..... | 7 | 147 | 12 | 147.63 | 11.98 | 12.02 | 12.01 | 144.36 | 356,000 | 394,000 | 2,729 | |
| 70 | ..... | ..... | ..... | ..... | 7 | 150 | 4 | 148.40 | 12.19 | 11.98 | 11.98 | 143.52 | 431,000 | 489,900 | 3,413 | |
| 71 | ..... | ..... | ..... | ..... | 7 | 154 | 4 | 148.28 | 12.37 | 12.11 | 12.00 | 145.32 | 377,000 | 439,200 | 3,022 | |
| 72 | ..... | ..... | ..... | ..... | 7 | 155 | 8 | 148.28 | 12.46 | 12.12 | 12.00 | 145.44 | 415,000 | 457,400 | 3,145 | |
| 73 | ..... | ..... | ..... | ..... | 10 | 152 | 12 | 147.88 | 12.43 | 11.98 | 12.04 | 143.64 | 340,000 | 471,000 | 3,279 | |
| E 82 | 1 | 0 | 2 | 1 | ..... | 151 | 8 | 147.29 | 12.14 | 12.11 | 12.09 | 146.41 | 322,000 | 451,600 | 3,084 | |
| 83 | ..... | ..... | ..... | 1 | ..... | 151 | 0 | 148.02 | 12.11 | 12.07 | 12.06 | 145.56 | 409,000 | 445,400 | 3,060 | |
| 84 | ..... | ..... | ..... | 1 | ..... | 151 | 12 | 148.64 | 12.20 | 12.07 | 11.98 | 144.60 | 378,000 | 463,800 | 3,207 | |
| 86 | ..... | ..... | ..... | 1 | ..... | 152 | 12 | 149.37 | 12.17 | 12.00 | 12.10 | 145.20 | 365,000 | 479,000 | 3,299 | |
| 87 | ..... | ..... | ..... | 1 | ..... | 150 | 0 | 147.78 | 12.18 | 11.98 | 12.04 | 144.00 | 397,000 | 485,300 | 3,370 | |
| 88 | ..... | ..... | ..... | 1 | ..... | 150 | 0 | 148.08 | 12.16 | 12.05 | 11.95 | 144.00 | 374,400 | 492,500 | 3,420 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 74 | 1 | 0 | 2 | 3 | ..... | 153 | 8 | 149.77 | 12.34 | 11.99 | 11.97 | 143.52 | 436,000 | 558,600 | 3,892 | |
| 75 | ..... | ..... | ..... | 3 | ..... | 150 | 8 | 148.91 | 12.23 | 12.00 | 11.90 | 142.80 | 397,000 | 562,000 | 3,936 | |
| 85 | ..... | ..... | ..... | 3 | ..... | 152 | 4 | 150.52 | 12.22 | 11.87 | 12.05 | 143.08 | 314,666 | 449,700 | 3,144 | |
| 89 | ..... | ..... | ..... | 3 | ..... | 152 | 12 | 149.15 | 12.30 | 11.97 | 12.02 | 143.88 | 490,000 | 556,500 | 3,868 | |
| E 106 | 1 | 0 | 2 | 6 | ..... | 147 | 8 | 147.14 | 11.98 | 12.12 | 11.93 | 144.59 | 556,000 | 776,200 | 5,368 | |
| 107 | ..... | ..... | ..... | 6 | ..... | 150 | 8 | 147.41 | 12.14 | 11.99 | 12.12 | 145.82 | 465,000 | 748,000 | 5,147 | |
| 108 | ..... | ..... | ..... | 6 | ..... | 147 | 4 | 146.04 | 11.98 | 11.98 | 12.14 | 145.44 | 592,000 | 810,000 | 5,569 | |
| 109 | ..... | ..... | ..... | 6 | ..... | 149 | 8 | 147.30 | 11.98 | 11.98 | 12.24 | 146.39 | 410,000 | 768,800 | 5,217 | |
| 112 | ..... | ..... | ..... | 6 | ..... | 147 | 0 | 147.13 | 11.94 | 12.02 | 12.03 | 144.60 | 435,000 | 775,000 | 5,360 | |
| E 45 | 1 | 2 | 4 | ..... | 7 | 150 | 4 | 147.55 | 12.25 | 11.99 | 11.98 | 143.64 | 231,000 | 232,700 | 1,620 | |
| 46 | ..... | ..... | ..... | ..... | 7 | 151 | 0 | 147.07 | 12.30 | 12.06 | 11.96 | 144.24 | 208,000 | 219,000 | 1,518 | |
| 47 | ..... | ..... | ..... | ..... | 7 | 152 | 4 | 148.06 | 12.35 | 12.00 | 11.99 | 143.88 | 208,000 | 220,500 | 1,533 | |
| 48 | ..... | ..... | ..... | ..... | 7 | 150 | 8 | 147.55 | 12.25 | 12.00 | 11.99 | 143.88 | 192,000 | 205,500 | 1,428 | |
| 49 | ..... | ..... | ..... | ..... | 10 | 151 | 12 | 147.98 | 12.31 | 12.00 | 12.00 | 144.00 | 172,800 | 268,100 | 1,862 | |
| E 51 | 1 | 2 | 4 | 1 | ..... | 153 | 4 | 149.78 | 12.10 | 12.08 | 12.10 | 146.17 | 286,000 | 333,600 | 2,282 | |
| 53 | ..... | ..... | ..... | 1 | ..... | 151 | 8 | 147.78 | 12.19 | 12.11 | 12.00 | 145.32 | 298,000 | 308,200 | 2,121 | |
| 54 | ..... | ..... | ..... | 1 | ..... | 151 | 4 | 147.43 | 12.26 | 12.00 | 12.05 | 144.60 | 304,000 | 321,000 | 2,220 | |
| 58 | ..... | ..... | ..... | 1 | ..... | 149 | 12 | 148.64 | 12.18 | 11.96 | 12.00 | 143.52 | 305,000 | 318,800 | 2,221 | |
| 60 | ..... | ..... | ..... | 1 | ..... | 146 | 0 | 144.92 | 12.16 | 12.00 | 11.98 | 143.16 | 343,000 | 343,000 | 2,396 | |
| 67 | ..... | ..... | ..... | 1 | ..... | 147 | 4 | 146.28 | 12.12 | 11.96 | 12.00 | 143.52 | 315,744 | 340,600 | 2,373 | |
| E 50 | 1 | 2 | 4 | 3 | ..... | 152 | 0 | 148.17 | 12.30 | 11.95 | 12.06 | 144.12 | 357,000 | 368,500 | 2,557 | |
| 52 | ..... | ..... | ..... | 3 | ..... | 149 | 4 | ..... | 12.07 | 11.98 | 12.09 | 144.23 | 318,000 | 356,700 | 2,473 | Voids. |
| 56 | ..... | ..... | ..... | 3 | ..... | 150 | 8 | 150.01 | 12.12 | 11.94 | 11.98 | 143.04 | 343,296 | 371,904 | 2,600 | |
| 57 | ..... | ..... | ..... | 3 | ..... | 151 | 4 | 147.66 | 12.21 | 12.08 | 12.00 | 144.96 | 371,000 | 386,200 | 2,664 | |
| 59 | ..... | ..... | ..... | 3 | ..... | 146 | 12 | ..... | 12.19 | 12.00 | 11.94 | 143.28 | 390,500 | 391,000 | 2,729 | |
| 65 | ..... | ..... | ..... | 3 | ..... | 147 | 0 | ..... | 12.20 | 12.20 | 11.87 | 144.81 | 378,000 | 379,900 | 2,623 | |
| E 55 | 1 | 2 | 4 | 6 | ..... | 148 | 12 | 148.77 | 12.15 | 11.84 | 12.01 | 142.20 | 498,000 | 517,000 | 3,636 | |
| 90 | ..... | ..... | ..... | 6 | ..... | 148 | 0 | 147.55 | 11.64 | 12.01 | 11.98 | 143.88 | 548,000 | 570,000 | 3,962 | |
| 92 | ..... | ..... | ..... | 6 | ..... | 145 | 0 | 147.94 | 11.90 | 11.91 | 11.95 | 142.32 | 471,000 | 510,000 | 3,583 | |
| 93 | ..... | ..... | ..... | 6 | ..... | 147 | 0 | 147.86 | 11.98 | 12.00 | 11.95 | 143.40 | 352,000 | 441,200 | 3,077 | |
| 94 | ..... | ..... | ..... | 6 | ..... | 146 | 0 | 147.97 | 11.98 | 11.94 | 11.92 | 142.32 | 428,000 | 540,816 | 3,800 | |
| E 1 | 1 | 3 | 6 | ..... | 7 | 150 | 12 | 147.42 | 12.24 | 12.04 | 11.99 | 144.36 | 167,000 | 189,200 | 1,311 | |
| 2 | ..... | ..... | ..... | ..... | 7 | 149 | 12 | 147.46 | 12.35 | 11.94 | 11.90 | 142.09 | 171,000 | 180,500 | 1,270 | |
| 3 | ..... | ..... | ..... | ..... | 7 | 153 | 0 | 147.91 | 12.23 | 12.24 | 11.94 | 146.15 | 181,000 | 214,000 | 1,464 | |
| 4 | ..... | ..... | ..... | ..... | 7 | 150 | 0 | 147.80 | 12.20 | 11.92 | 12.06 | 143.75 | 182,000 | 198,600 | 1,382 | |
| 5 | ..... | ..... | ..... | ..... | 10 | 149 | 8 | 148.28 | 12.12 | 12.10 | 11.88 | 143.75 | 201,250 | 253,400 | 1,763 | |
| E 9 | 1 | 3 | 6 | 1 | ..... | 146 | 12 | 149.35 | 11.85 | 11.90 | 12.04 | 143.28 | 296,000 | 315,000 | 2,196 | |
| 12 | ..... | ..... | ..... | 1 | ..... | 144 | 0 | 147.54 | 11.98 | 11.89 | 11.84 | 140.78 | 281,000 | 281,000 | 1,996 | |
| 13 | ..... | ..... | ..... | 1 | ..... | 147 | 12 | 150.25 | 12.04 | 11.83 | 11.93 | 141.13 | 298,000 | 311,500 | 2,207 | |
| 14 | ..... | ..... | ..... | 1 | ..... | 151 | 12 | 148.78 | 12.20 | 12.14 | 11.90 | 144.47 | 291,000 | 300,900 | 2,083 | |
| 19 | ..... | ..... | ..... | 1 | ..... | 147 | 4 | 149.62 | 12.00 | 11.97 | 11.84 | 141.72 | 240,000 | 304,100 | 2,146 | |
| 21 | ..... | ..... | ..... | 1 | ..... | 145 | 12 | 148.71 | 11.86 | 11.90 | 12.00 | 142.80 | 272,000 | 293,000 | 2,052 | |

CONCRETE CUBES MADE OF ALSEN'S PORTLAND CEMENT—Continued.

| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| E 6 | 1 | 3 | 6 | 3 | ..... | 149 | 12 | 147.56 | 12.22 | 12.03 | 11.98 | 143.52 | 315,000 | 323,000 | 2,251 | |
| 7 | ..... | ..... | ..... | 3 | ..... | 148 | 8 | 148.13 | 12.08 | 12.00 | 11.95 | 143.40 | 298,000 | 334,400 | 2,332 | |
| 10 | ..... | ..... | ..... | 3 | ..... | 145 | 8 | 148.71 | 11.98 | 11.83 | 11.98 | 141.13 | 291,000 | 316,500 | 2,243 | |
| 15 | ..... | ..... | ..... | 3 | ..... | 158 | 0 | 149.14 | 12.25 | 11.93 | 12.13 | 144.71 | 347,304 | 331,000 | 2,633 | |
| 16 | ..... | ..... | ..... | 3 | ..... | 149 | 8 | 148.40 | 12.13 | 12.06 | 11.90 | 143.51 | 284,500 | 336,300 | 2,343 | |
| 18 | ..... | ..... | ..... | 3 | ..... | 147 | 4 | 147.01 | 11.99 | 11.90 | 12.13 | 144.35 | 278,000 | 330,600 | 2,290 | |
| E 8 | 1 | 3 | 6 | 6 | ..... | 148 | 0 | 149.25 | 12.02 | 11.93 | 11.95 | 142.56 | 397,000 | 421,000 | 2,953 | |
| 11 | ..... | ..... | ..... | 6 | ..... | 147 | 0 | 146.89 | 12.11 | 12.03 | 11.87 | 142.80 | 370,000 | 427,000 | 2,990 | |
| 17 | ..... | ..... | ..... | 6 | ..... | 149 | 4 | 147.30 | 12.14 | 11.87 | 12.15 | 144.22 | 448,000 | 451,000 | 3,127 | |
| 20 | ..... | ..... | ..... | 6 | ..... | 148 | 0 | 148.99 | 12.01 | 11.90 | 12.01 | 142.92 | 312,000 | 411,000 | 2,876 | |
| 22 | ..... | ..... | ..... | 6 | ..... | 146 | 4 | 147.24 | 11.85 | 12.02 | 12.05 | 144.84 | 490,000 | 461,000 | 3,188 | |
| E 23 | 1 | 6 | 12 | ..... | 7 | ..... | ..... | ..... | 12.32 | 11.99 | 12.00 | 143.88 | 42,300 | 43,100 | 300 | Corners gone. |
| 24 | ..... | ..... | ..... | ..... | 7 | ..... | ..... | ..... | 12.35 | 12.08 | 11.86 | 143.27 | 63,000 | 67,600 | 472 | Do. |
| 25 | ..... | ..... | ..... | ..... | 7 | ..... | ..... | ..... | 12.35 | 12.04 | 12.14 | 146.16 | 57,800 | 63,600 | 435 | Do. |
| 27 | ..... | ..... | ..... | ..... | 7 | ..... | ..... | ..... | 12.16 | 12.23 | 11.98 | 146.51 | 41,500 | 45,200 | 308 | Do. |
| 26 | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | 12.17 | 11.89 | 12.11 | 143.99 | 67,600 | 81,800 | 568 | Do. |
| E 30 | 1 | 6 | 12 | 1 | ..... | 130 | 8 | ..... | 12.16 | 11.99 | 12.06 | 144.60 | 101,200 | 103,600 | 716 | Corners gone. |
| 32 | ..... | ..... | ..... | 1 | ..... | 131 | 8 | ..... | 12.22 | 11.97 | 11.93 | 142.80 | 102,800 | 106,600 | 746 | Do. |
| 33 | ..... | ..... | ..... | 1 | ..... | 128 | 12 | ..... | 12.10 | 11.82 | 11.98 | 141.60 | 103,000 | 106,000 | 749 | Do. |
| 36 | ..... | ..... | ..... | 1 | ..... | 141 | 8 | ..... | 12.18 | 11.96 | 12.06 | 144.24 | 100,968 | 136,200 | 944 | |
| 37 | ..... | ..... | ..... | 1 | ..... | 142 | 0 | ..... | 12.40 | 12.02 | 11.90 | 143.04 | 141,000 | 144,000 | 1,007 | |
| 39 | ..... | ..... | ..... | 1 | ..... | 141 | 0 | ..... | 12.27 | 11.98 | 12.15 | 145.56 | 148,500 | 156,200 | 1,073 | |
| E 29 | 1 | 6 | 12 | 3 | ..... | 132 | 4 | ..... | 12.19 | 12.09 | 11.84 | 143.15 | 108,400 | 108,400 | 757 | Voids and corners gone. |
| 31 | ..... | ..... | ..... | 3 | ..... | 118 | 12 | ..... | 12.10 | 11.80 | 11.97 | 141.25 | 82,000 | 86,200 | 610 | Corners gone. |
| 34 | ..... | ..... | ..... | 3 | ..... | 136 | 12 | ..... | 12.24 | 12.04 | 11.96 | 144.00 | 91,000 | 121,000 | 840 | Do. |
| 35 | ..... | ..... | ..... | 3 | ..... | 135 | 8 | ..... | 12.14 | 11.98 | 12.07 | 144.60 | 131,000 | 134,800 | 932 | Do. |
| 41 | ..... | ..... | ..... | 3 | ..... | 137 | 4 | ..... | 12.02 | 11.87 | 12.08 | 143.39 | 157,729 | 166,100 | 1,158 | Voids. |
| 44 | ..... | ..... | ..... | 3 | ..... | 132 | 8 | ..... | 12.37 | 11.92 | 12.02 | 143.40 | 108,000 | 109,700 | 765 | Corners gone and voids. |
| E 28 | 1 | 6 | 12 | 6 | ..... | 136 | 8 | ..... | 12.17 | 11.97 | 12.15 | 145.44 | 182,300 | 182,300 | 1,254 | Voids. |
| 38 | ..... | ..... | ..... | 6 | ..... | 142 | 0 | ..... | 12.29 | 12.12 | 12.17 | 147.50 | 201,000 | 226,500 | 1,536 | Do. |
| 40 | ..... | ..... | ..... | 6 | ..... | 128 | 12 | ..... | 12.26 | 11.89 | 12.06 | 143.39 | 158,000 | 168,600 | 1,141 | Do. |
| 42 | ..... | ..... | ..... | 6 | ..... | 126 | 12 | ..... | 12.22 | 12.00 | 12.00 | 144.00 | 179,000 | 182,000 | 1,264 | Voids and corners gone. |
| 43 | ..... | ..... | ..... | 6 | ..... | 138 | 12 | ..... | 12.14 | 12.02 | 11.95 | 143.64 | 201,096 | 204,000 | 1,420 | |




6-months.

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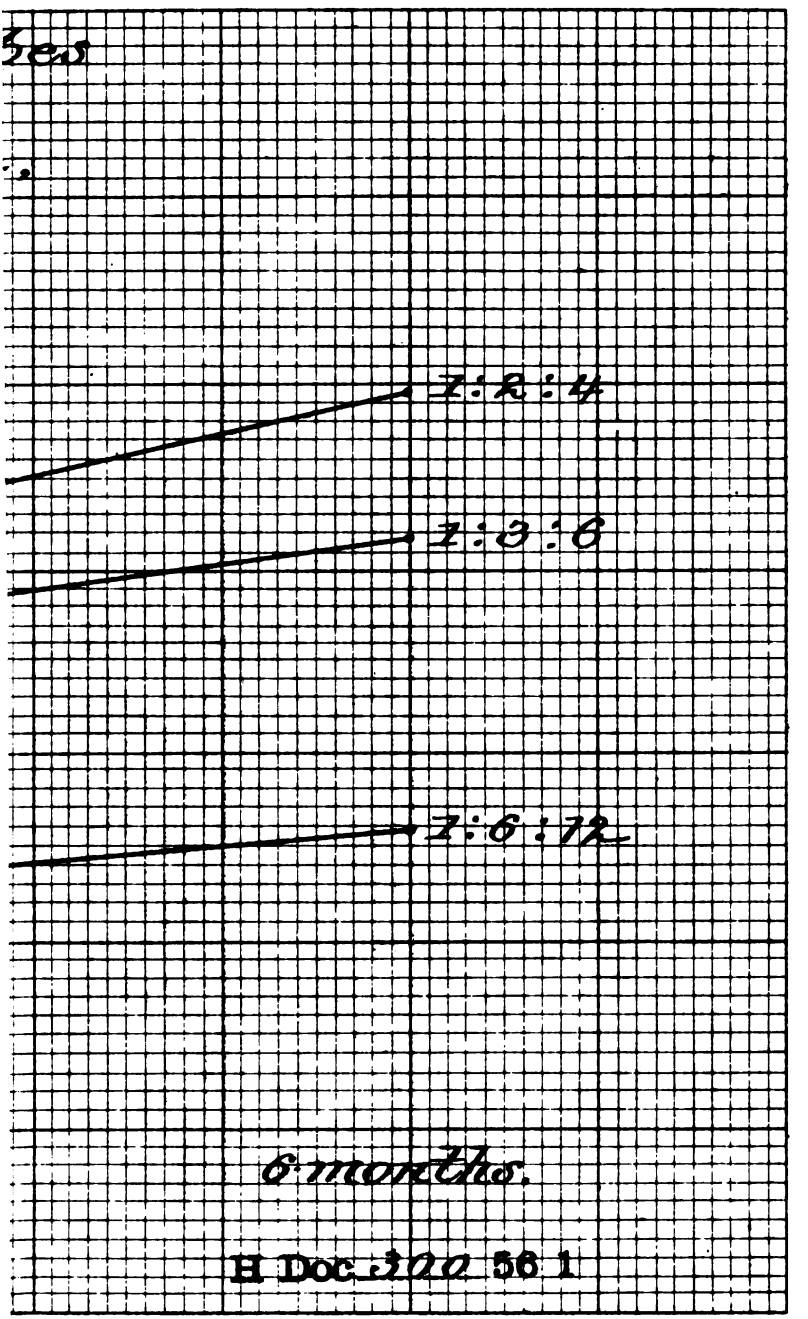
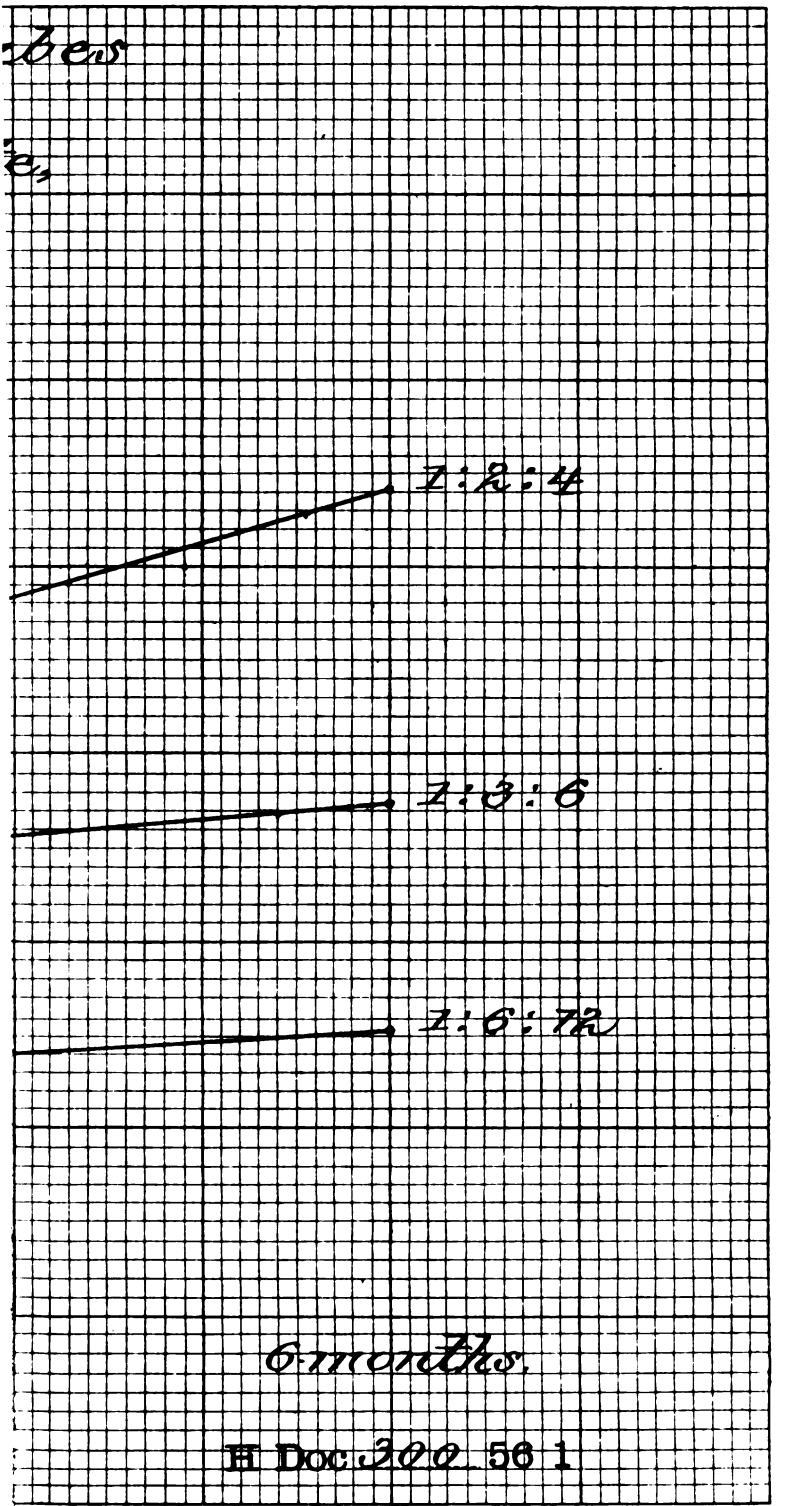

1:2:4
1:3:6
1:6:12
6 months.

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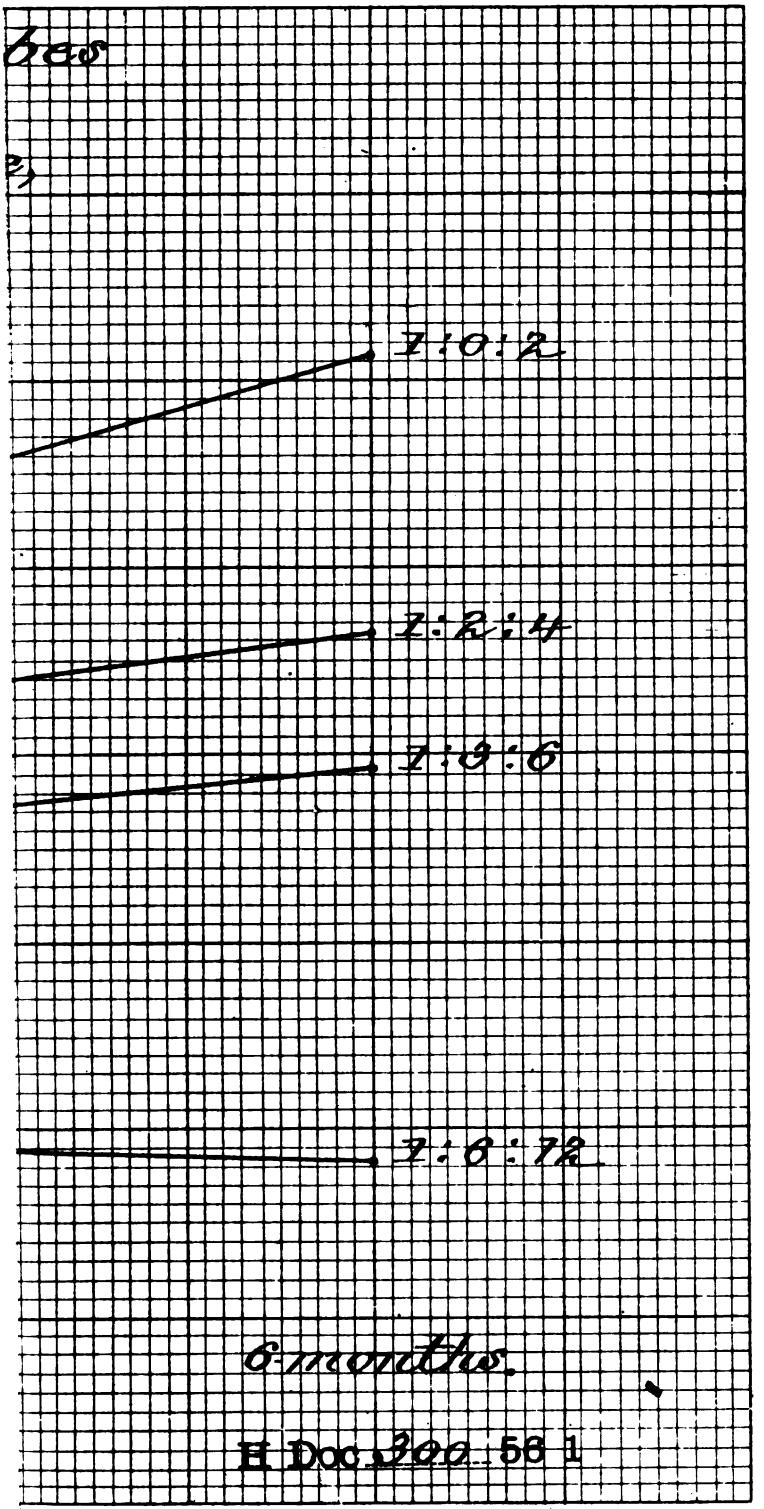
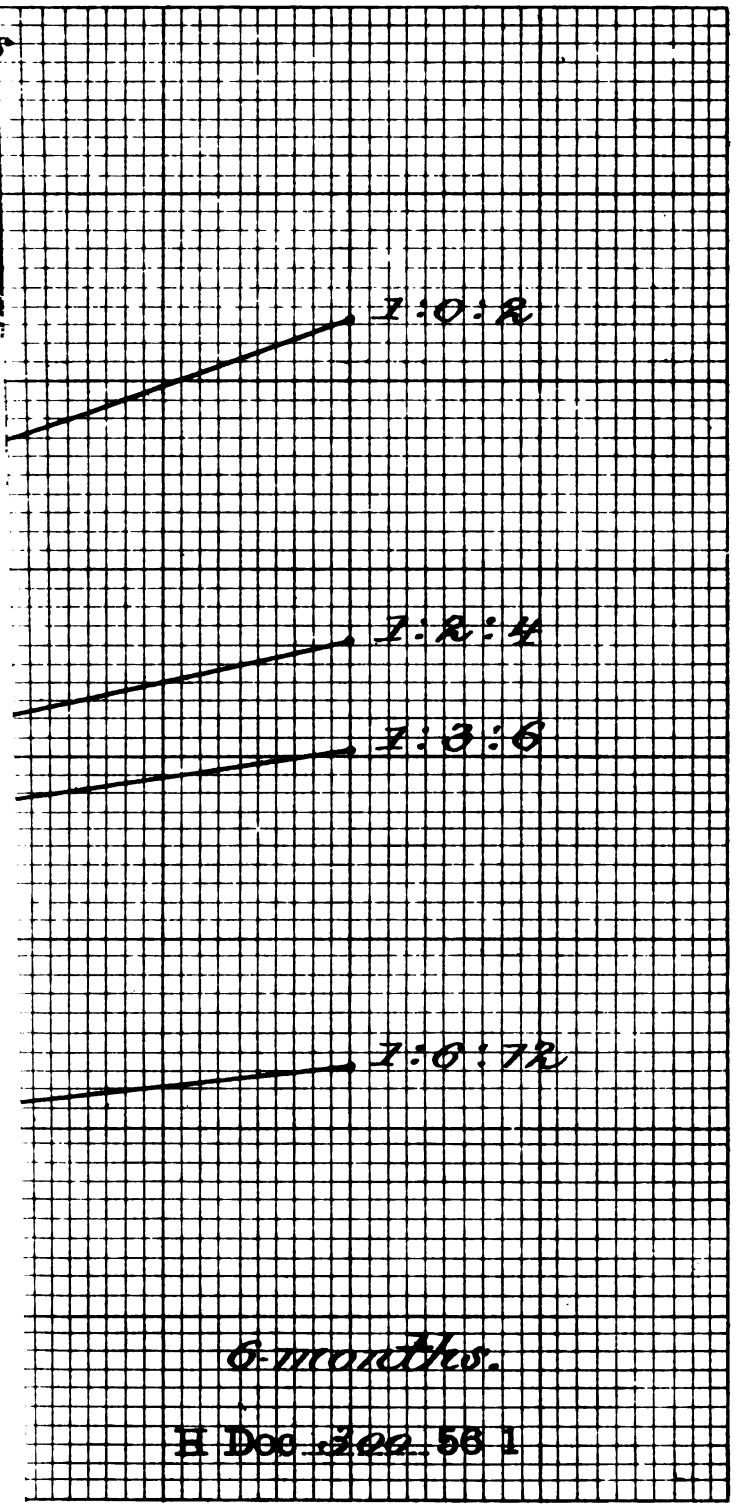

bas
2,
1:0:2
1:2:14
1:9:6
1:6:72
6 months.

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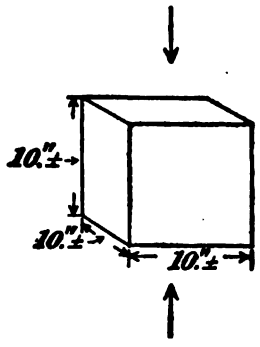
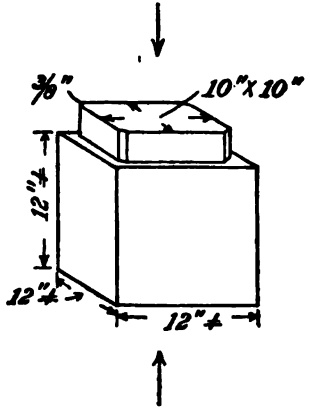
## CONCRETE CUBES MADE OF ALPHA PORTLAND CEMENT.




| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. in.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| C 2 | 1 | 0 | 2 | 3 | ..... | 87 | 8 | 151.11 | 9.78 | 10.19 | 10.04 | 102.31 | 285,000 | 597,100 | 5,36 | |
| 5 | ..... | ..... | ..... | 3 | ..... | 87 | 0 | 150.06 | 9.88 | 10.00 | 10.14 | 101.40 | 296,000 | 544,500 | 5,370 | |
| 8 | ..... | ..... | ..... | 3 | ..... | 86 | 4 | 151.33 | 9.78 | 9.97 | 10.10 | 100.70 | 336,000 | 509,000 | 5,055 | |
| 9 | ..... | ..... | ..... | 3 | ..... | 87 | 0 | 152.06 | 9.75 | 10.00 | 10.14 | 101.40 | 347,000 | 541,400 | 5,339 | |
| 10 | ..... | ..... | ..... | 3 | ..... | 87 | 0 | 151.43 | 9.80 | 10.10 | 10.03 | 101.30 | 338,000 | 589,000 | 5,814 | |
| 12 | ..... | ..... | ..... | 3 | ..... | 87 | 4 | 151.26 | 9.85 | 9.96 | 10.16 | 101.19 | 320,000 | 543,000 | 5,366 | |
| C 1 | 1 | 0 | 2 | 6 | ..... | 87 | 0 | 150.10 | 9.80 | 10.20 | 10.02 | 102.20 | 479,000 | 708,300 | 6,980 | |
| 3 | ..... | ..... | ..... | 6 | ..... | 85 | 8 | 149.26 | 9.82 | 10.04 | 10.04 | 100.80 | 544,320 | 717,000 | 7,113 | |
| 4 | ..... | ..... | ..... | 6 | ..... | 87 | 0 | 149.17 | 9.90 | 10.03 | 10.15 | 101.80 | 514,000 | 670,000 | 6,581 | |
| 6 | ..... | ..... | ..... | 6 | ..... | 86 | 8 | 150.27 | 9.80 | 10.15 | 10.00 | 101.50 | 432,000 | 634,000 | 6,246 | |
| 7 | ..... | ..... | ..... | 6 | ..... | 88 | 0 | 152.12 | 9.84 | 10.19 | 9.97 | 101.59 | 521,000 | 678,400 | 6,678 | |
| 11 | ..... | ..... | ..... | 6 | ..... | 87 | 0 | 150.09 | 9.82 | 10.18 | 10.02 | 102.00 | 442,000 | 590,500 | 5,789 | |

## Experiments with Concentrated Stresses.

Loads applied on a 10″ x 10″ plate on one surface of the concrete.




CONCRETE CUBES MADE OF ALPHA PORTLAND CEMENT.

| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | Sectional areas. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surfaces. | | | | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| C 76 | 1 | 0 | 2 | 1 | ..... | 161 | 4 | 154.54 | 12.49 | 12.00 | 12.08 | 144.96 | 283,000 | 580,500 | 3,675 | The lower figures in each case in the column of strength per square inch refer to the concentrated surface. |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 5,820 | |
| 80 | 1 | 0 | 2 | 1 | ..... | 158 | 0 | 158.70 | 12.45 | 12.00 | 11.89 | 142.68 | 370,000 | 510,800 | 3,580 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 5,122 | |
| 86 | 1 | 0 | 2 | 1 | ..... | 153 | 4 | 151.53 | 12.29 | 11.97 | 11.88 | 142.20 | 329,000 | 444,600 | 3,127 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,458 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C 44 | 1 | 2 | 4 | 1 | ..... | 144 | 12 | 145.97 | 11.90 | 11.98 | 12.02 | 144.00 | 239,000 | 284,000 | 1,972 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,848 | |
| 49 | 1 | 2 | 4 | 1 | ..... | 146 | 4 | 145.54 | 12.18 | 11.92 | 11.96 | 142.56 | 261,900 | 297,200 | 2,085 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,980 | |
| 51 | 1 | 2 | 4 | 1 | ..... | 148 | 8 | 148.26 | 12.07 | 11.99 | 11.96 | 143.40 | 241,000 | 294,800 | 2,056 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,956 | |
| 67 | 1 | 2 | 4 | 1 | ..... | 150 | 8 | 148.80 | 12.26 | 11.98 | 11.94 | 143.04 | 264,000 | 265,000 | 1,858 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,657 | |
| C 89 | 1 | 2 | 4 | 3 | ..... | 150 | 8 | 152.78 | 11.92 | 11.92 | 11.98 | 142.80 | 331,000 | 408,200 | 2,859 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,093 | |
| 95 | 1 | 2 | 4 | 3 | ..... | 150 | 8 | 149.87 | 12.02 | 12.05 | 11.98 | 144.36 | 380,000 | 380,500 | 2,636 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,816 | |
| 97 | 1 | 2 | 4 | 3 | ..... | 151 | 4 | 151.00 | 12.03 | 11.99 | 12.00 | 143.88 | 392,000 | 394,000 | 2,738 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,951 | |
| C 93 | 1 | 2 | 4 | 6 | ..... | 152 | 8 | 151.61 | 12.08 | 11.98 | 12.06 | 144.48 | 414,000 | 513,400 | 3,558 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 5,148 | |
| 94 | 1 | 2 | 4 | 6 | ..... | 149 | 0 | 150.90 | 11.96 | 12.09 | 11.80 | 142.66 | 464,000 | 501,800 | 3,517 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 5,082 | |
| 96 | 1 | 2 | 4 | 6 | ..... | 149 | 8 | 150.50 | 12.00 | 11.97 | 11.95 | 143.04 | 460,000 | 511,000 | 3,572 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 5,124 | |

CONCRETE CUBES MADE OF GERMANIA PORTLAND CEMENT.

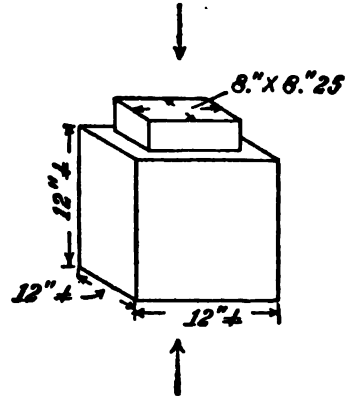
| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 84 | 1 | 0 | 2 | 1 | ..... | 152 | 12 | 149.40 | 12.30 | 11.92 | 12.05 | 143.64 | 356,000 | 410,000 | 2,854 | Bearing surface irregular. |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,112 | |
| 87 | 1 | 0 | 2 | 1 | ..... | 153 | 4 | 149.00 | 12.23 | 12.04 | 12.07 | 145.32 | 408,000 | 430,500 | 2,962 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,317 | |
| 88 | 1 | 0 | 2 | 1 | ..... | 154 | 4 | 149.00 | 12.29 | 12.03 | 12.10 | 145.56 | 405,000 | 440,400 | 3,026 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,416 | |
| D 45 | 1 | 2 | 4 | 1 | ..... | 158 | 12 | 149.76 | 12.44 | 12.26 | 12.01 | 147.24 | 298,000 | 318,800 | 2,162 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,192 | |
| 54 | 1 | 2 | 4 | 1 | ..... | 154 | 0 | 148.83 | 12.50 | 11.96 | 11.96 | 143.04 | 326,000 | 354,000 | 2,475 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,550 | |
| 60 | 1 | 2 | 4 | 1 | ..... | 150 | 4 | 145.96 | 12.20 | 12.02 | 12.13 | 145.80 | 245,000 | 299,600 | 2,055 | Voids. |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,004 | |
| D 94 | 1 | 2 | 4 | 3 | ..... | 148 | 0 | 149.26 | 11.98 | 11.83 | 12.09 | 143.02 | 254,000 | 275,900 | 1,929 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,767 | |
| 95 | 1 | 2 | 4 | 3 | ..... | 146 | 8 | 149.10 | 11.99 | 11.84 | 11.96 | 141.61 | 218,000 | 296,500 | 2,094 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,973 | |
| 108 | 1 | 2 | 4 | 3 | ..... | 145 | 12 | 146.64 | 11.84 | 11.90 | 12.19 | 145.06 | 303,000 | 317,000 | 2,185 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,179 | |

CONCRETE CUBES MADE OF GERMANIA PORTLAND CEMENT—Continued.

| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | Sectional areas. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| D 97 | 1 | 2 | 4 | 6 | ..... | 149 | 0 | 147.90 | 12.10 | 11.89 | 12.10 | 143.87 | 200,000 | 363,800 | 2,529 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,648 | |
| 98 | 1 | 2 | 4 | 6 | ..... | 149 | 0 | 149.01 | 11.99 | 11.89 | 12.12 | 144.11 | 281.000 | 347,500 | 2,411 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,485 | |
| 99 | 1 | 2 | 4 | 6 | ..... | 149 | 0 | 148.76 | 12.12 | 12.00 | 11.90 | 142.80 | 376,000 | 411,800 | 2,884 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,130 | |
| CONCRETE CUBES MADE OF ALSEN'S PORTLAND CEMENT. | | | | | | | | | | | | | | | | |
| E 79 | 1 | 0 | 2 | 1 | ..... | 151 | 0 | 149.64 | 12.08 | 11.92 | 12.11 | 144.35 | 275,000 | 329,000 | 2,279 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,299 | |
| 80 | 1 | 0 | 2 | 1 | ..... | 148 | 12 | 147.53 | 12.04 | 11.94 | 12.12 | 144.71 | 305,000 | 342,400 | 2,366 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,434 | |
| 81 | 1 | 0 | 2 | 1 | ..... | 149 | 12 | 148.40 | 12.10 | 12.12 | 11.89 | 144.11 | 274,000 | 342,000 | 2,373 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 3,430 | |
| E 61 | 1 | 2 | 4 | 1 | ..... | 148 | 8 | 145.70 | 12.17 | 12.09 | 11.97 | 144.72 | 286,000 | 288,500 | 1,993 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,893 | |
| 62 | 1 | 2 | 4 | 1 | ..... | 149 | 0 | 146.59 | 12.24 | 12.11 | 11.85 | 143.50 | 275,000 | 282,500 | 1,969 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,824 | |
| 63 | 1 | 2 | 4 | 1 | ..... | 148 | 12 | 144.74 | 12.15 | 12.20 | 11.98 | 146.16 | 280,000 | 285,300 | 1,952 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,861 | |
| E 91 | 1 | 2 | 4 | 3 | ..... | 144 | 8 | 143.06 | 11.81 | 11.98 | 11.92 | 142.80 | 244,000 | 273,000 | 1,912 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,788 | |
| 95 | 1 | 2 | 4 | 3 | ..... | 143 | 0 | 143.65 | 11.67 | 11.98 | 11.89 | 142.44 | 268,000 | 289,800 | 2,035 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,906 | |
| 96 | 1 | 2 | 4 | 3 | ..... | 146 | 0 | 149.23 | 11.75 | 11.98 | 12.01 | 143.88 | 217,000 | 276,000 | 1,918 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 2,768 | |
| E 96 | 1 | 2 | 4 | 6 | ..... | 144 | 4 | 147.70 | 11.71 | 12.08 | 11.98 | 144.12 | 398,000 | 419,200 | 2,909 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,204 | |
| 97 | 1 | 2 | 4 | 6 | ..... | 144 | 8 | 149.45 | 11.68 | 12.02 | 11.90 | 143.04 | 327,000 | 413,000 | 2,887 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,142 | |
| 99 | 1 | 2 | 4 | 6 | ..... | 147 | 0 | 148.61 | 11.86 | 12.00 | 12.02 | 144.24 | 299,000 | 406,000 | 2,806 | |
| | | | | | | | | | | 10.00 | 10.00 | 99.72 | ..... | ..... | 4,061 | |

## Experiments with Concentrated Stresses.

Loads applied on an 8″ x 8″.25 plate on one surface of the concrete.




CONCRETE CUBES MADE OF ALPHA PORTLAND CEMENT.

| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | Sectional areas. | Ultimate strength. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surfaces. | | | First crack. | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| C 68 | 1 | 0 | 2 | 1 | ..... | 157 | 4 | 151.91 | 12.37 | 11.95 | 12.10 | 144.60 | 268,000 | 363,100 | 2,511 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,501 | |
| 84 | 1 | 0 | 2 | 1 | ..... | 155 | 8 | 151.28 | 12.48 | 11.89 | 11.97 | 142.32 | 267,000 | 342,500 | 2,407 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,189 | |
| 88 | 1 | 0 | 2 | 1 | ..... | 162 | 4 | 151.92 | 12.70 | 12.18 | 11.93 | 145.31 | 208,000 | 302,100 | 2,079 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,577 | |
| C 45 | 1 | 2 | 4 | 1 | ..... | 147 | 12 | 146.77 | 12.11 | 11.99 | 11.98 | 143.64 | 151,000 | 221,000 | 1,539 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,348 | |
| 52 | 1 | 2 | 4 | 1 | ..... | 143 | 8 | 145.32 | 12.08 | 11.90 | 11.87 | 141.25 | 210,700 | 213,000 | 1,508 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,227 | |

CONCRETE CUBES MADE OF ALPHA PORTLAND CEMENT—Continued.

| Marks. | Composition. | | | Age. | | Weight. | | | Dimensions. | | | | Ultimate strength. | | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | | | Total. | | Per cubic foot. | Height. | Compressed surfaces. | | Sectional area. | First crack. | Total. | Per square inch. | |
| | | | | *Mos.* | *Days.* | *Pounds.* | *Ounces.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| C 98 | 1 | 2 | 4 | 3 | ..... | 150 | 0 | 148.63 | 12.08 | 12.05 | 11.98 | 144.36 | 269,000 | 281,400 | 1,949 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,264 | |
| 100 | 1 | 2 | 4 | 3 | ..... | 151 | 8 | 149.25 | 12.09 | 12.03 | 12.06 | 145.08 | 315,000 | 317,800 | 2,190 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,815 | |
| 103 | 1 | 2 | 4 | 3 | ..... | 148 | 12 | 151.54 | 11.94 | 11.76 | 12.08 | 142.06 | 273,000 | 296,000 | 2,098 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,515 | |
| 99 | 1 | 2 | 4 | 6 | ..... | 151 | 0 | 150.50 | 12.03 | 12.06 | 11.95 | 144.12 | 356,000 | 391,000 | 2,713 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,924 | |
| 101 | 1 | 2 | 4 | 6 | ..... | 152 | 8 | 150.74 | 12.07 | 12.10 | 11.97 | 144.84 | 319,000 | 363,000 | 2,510 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,508 | |
| 102 | 1 | 2 | 4 | 6 | ..... | 152 | 8 | 151.38 | 12.10 | 11.92 | 12.07 | 143.87 | 332,000 | 368,000 | 2,558 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,576 | |
| CONCRETE CUBES MADE OF GERMANIA PORTLAND CEMENT. | | | | | | | | | | | | | | | | |
| D 83 | 1 | 0 | 2 | 1 | ..... | 151 | 12 | 149.79 | 12.28 | 11.95 | 11.98 | 142.56 | 271,000 | 300,200 | 2,106 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,548 | |
| 85 | 1 | 0 | 2 | 1 | ..... | 141 | 0 | ..... | 12.23 | 12.00 | 12.14 | 145.68 | 195,000 | 204,700 | 1,405 | End surface deficient. |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,101 | |
| 86 | 1 | 0 | 2 | 1 | ..... | 149 | 0 | 149.88 | 12.04 | 11.89 | 12.00 | 142.68 | 298,000 | 352,000 | 2,467 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,338 | |
| D 112 | 1 | 0 | 2 | 6 | ..... | 149 | 0 | 150.51 | 11.86 | 12.03 | 11.99 | 144.24 | 372,000 | 450,500 | 3,123 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 6,826 | |
| 113 | 1 | 0 | 2 | 6 | ..... | 151 | 4 | 148.66 | 11.97 | 12.01 | 12.23 | 146.88 | 342,000 | 430,100 | 2,928 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 6,517 | |
| D 46 | 1 | 2 | 4 | 1 | ..... | 158 | 4 | 150.18 | 12.54 | 12.10 | 12.00 | 145.20 | 219,000 | 237,800 | 1,638 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,608 | |
| 52 | 1 | 2 | 4 | 1 | ..... | 158 | 12 | 148.70 | 12.47 | 11.99 | 11.95 | 143.28 | 220,000 | 233,000 | 1,626 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,530 | |
| 63 | 1 | 2 | 4 | 1 | ..... | 158 | 0 | 147.79 | 12.29 | 12.15 | 11.98 | 145.56 | 219,000 | 239,400 | 1,645 | |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,627 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D 101 | 1 | 2 | 4 | 3 | ..... | 147 | 0 | 149.49 | 11.96 | 12.08 | 11.81 | 142.07 | 218,000 | 227,000 | 1,598 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,439 |
| 104 | 1 | 2 | 4 | 3 | ..... | 145 | 4 | 147.35 | 11.82 | 12.10 | 11.91 | 144.11 | 216,000 | 236,500 | 1,641 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,583 |
| 106 | 1 | 2 | 4 | 3 | ..... | 147 | 4 | 148.36 | 11.92 | 12.08 | 11.96 | 143.88 | 234,000 | 234,000 | 1,626 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,545 |
| D 100 | 1 | 2 | 4 | 6 | ..... | 146 | 8 | 148.11 | 12.08 | 11.90 | 11.89 | 141.49 | 276,000 | 286,400 | 2,024 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,339 |
| 102 | 1 | 2 | 4 | 6 | ..... | 149 | 8 | 149.10 | 11.82 | 12.37 | 11.85 | 146.58 | 297,000 | 318,500 | 2,173 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,826 |
| 105 | 1 | 2 | 4 | 6 | ..... | 158 | 8 | 150.62 | 12.12 | 11.90 | 12.21 | 145.30 | 298,000 | 302,400 | 2,061 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,582 |

CONCRETE CUBES MADE OF ALSEN'S PORTLAND CEMENT.

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 76 | 1 | 0 | 2 | 1 | ..... | 150 | 4 | 149.16 | 12.17 | 11.87 | 12.05 | 143.03 | 218,000 | 303,800 | 2,124 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,603 |
| 77 | 1 | 0 | 2 | 1 | ..... | 151 | 0 | 147.56 | 12.27 | 11.93 | 12.08 | 144.11 | 209,000 | 249,800 | 1,738 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,785 |
| 78 | 1 | 0 | 2 | 1 | ..... | 151 | 8 | 148.15 | 12.12 | 12.10 | 12.05 | 145.80 | 213,000 | 255,600 | 1,753 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,872 |
| E 110 | 1 | 0 | 2 | 6 | ..... | 147 | 0 | 147.27 | 11.90 | 11.90 | 12.18 | 144.94 | 356,000 | 439,000 | 3,028 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 6,651 |
| 111 | 1 | 0 | 2 | 6 | ..... | 148 | 8 | 147.28 | 11.96 | 12.12 | 12.02 | 145.68 | 334,000 | 408,500 | 2,770 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 6,114 |
| E 64 | 1 | 2 | 4 | 1 | ..... | 151 | 4 | 147.34 | 12.20 | 11.85 | 12.27 | 145.40 | 219,000 | 223,100 | 1,534 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,380 |
| 66 | 1 | 2 | 4 | 1 | ..... | 149 | 0 | 147.77 | 12.12 | 12.03 | 11.96 | 143.76 | 210,000 | 216,200 | 1,504 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,276 |
| 68 | 1 | 2 | 4 | 1 | ..... | 146 | 8 | 145.54 | 12.13 | 11.96 | 12.00 | 143.40 | 198,000 | 200,900 | 1,401 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,044 |
| E 101 | 1 | 2 | 4 | 3 | ..... | 146 | 8 | 149.99 | 11.74 | 11.98 | 12.00 | 143.76 | 162,000 | 223,000 | 1,551 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,379 |
| 102 | 1 | 2 | 4 | 3 | ..... | 143 | 4 | 149.07 | 11.57 | 11.95 | 12.01 | 143.52 | 172,000 | 213,000 | 1,484 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,227 |
| 108 | 1 | 2 | 4 | 3 | ..... | 145 | 0 | 148.78 | 11.56 | 12.03 | 12.11 | 145.68 | 181,000 | 242,400 | 1,664 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 3,673 |
| E 100 | 1 | 2 | 4 | 6 | ..... | 148 | 0 | 148.74 | 11.94 | 11.96 | 12.04 | 144.00 | 260,000 | 284,000 | 1,972 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 4,308 |
| 104 | 1 | 2 | 4 | 6 | ..... | 145 | 8 | 147.91 | 11.62 | 12.14 | 12.05 | 146.29 | 296,000 | 362,100 | 2,475 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,486 |
| 105 | 1 | 2 | 4 | 6 | ..... | 146 | 0 | 148.79 | 11.63 | 12.04 | 12.11 | 145.80 | 310,000 | 340,600 | 2,336 |
| | | | | | | | | | | 8.00 | 8.25 | 66.00 | ..... | ..... | 5,161 |

## Concrete Tests.

### MEAN COMPRESSIVE STRENGTH.

12-INCH CUBES.

| Brand of cement. | Composition. | | | Mean compressive strength per square inch at age of— | | | |
|---|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | 7 days. | 1 month. | 3 months. | 6 months. |
| | | | | *Pounds.* | *Pounds.* | *Pounds.* | *Pounds.* |
| Saylor's Portland | 1 | 2 | 4 | 1,724 | 2,288 | 2,772 | 3,510 |
| | 1 | 3 | 6 | 1,625 | 2,568 | 2,882 | 3,567 |
| | 1 | 6 | 12 | 675 | 800 | 1,128 | 1,542 |
| Atlas Portland | 1 | 2 | 4 | 1,387 | 2,428 | 2,966 | 3,956 |
| | 1 | 3 | 6 | 1,050 | 1,816 | 2,588 | 3,170 |
| | 1 | 6 | 12 | 594 | 1,090 | 1,201 | 1,563 |
| Alpha Portland | 1 | 0 | 2 | 3,294 | 5,053 | 5,047 | ..... |
| | 1 | 2 | 4 | 904 | 2,420 | 3,123 | 4,411 |
| | 1 | 3 | 6 | 892 | 2,150 | 2,355 | 2,750 |
| | 1 | 6 | 12 | 564 | 1,218 | 1,257 | 1,582 |
| Germania Portland | 1 | 0 | 2 | 2,734 | 3,246 | 3,858 | 5,129 |
| | 1 | 2 | 4 | 2,219 | 2,642 | 3,082 | 3,643 |
| | 1 | 3 | 6 | 1,550 | 2,174 | 2,486 | 2,980 |
| | 1 | 6 | 12 | 759 | 987 | 963 | 815 |
| Alsen's Portland | 1 | 0 | 2 | 3,118 | 3,240 | 3,710 | 5,332 |
| | 1 | 2 | 4 | 1,592 | 2,269 | 2,608 | 3,612 |
| | 1 | 3 | 6 | 1,488 | 2,114 | 2,349 | 3,026 |
| | 1 | 6 | 12 | 417 | 873 | 844 | 1,328 |

10-INCH CUBES.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Alpha Portland | 1 | 0 | 2 | ..... | ..... | 5,463 | 6,556 |

## Concrete Tests.

### MEAN COMPRESSIVE STRENGTH.

12-INCH CUBES WITH CONCENTRATED STRESS ON A 10″ × 10″ PLATE ON ONE SURFACE.

| Brand of cement. | Composition. | | | Load per square inch on concentrated surface. | | |
|---|---|---|---|---|---|---|
| | Cement. | Sand. | Broken stone. | Age, 1 month. | Age, 3 months. | Age, 6 months. |
| | | | | *Pounds.* | *Pounds.* | *Pounds.* |
| Alpha Portland | 1 | 0 | 2 | 4,967 | ..... | ..... |
| | 1 | 2 | 4 | 2,860 | 3,958 | 5,101 |
| Germania Portland | 1 | 0 | 2 | 4,282 | ..... | ..... |
| | 1 | 2 | 4 | 3,249 | 2,973 | 3,754 |
| Alsen's Portland | 1 | 0 | 2 | 3,388 | ..... | ..... |
| | 1 | 2 | 4 | 2,859 | 2,804 | 4,136 |

12-INCH CUBES WITH CONCENTRATED STRESS ON A PLATE 8″ × 8″.25 ON ONE SURFACE.

| | | | | | | |
|---|---|---|---|---|---|---|
| Alpha Portland | 1 | 0 | 2 | 5,069 | ..... | ..... |
| | 1 | 2 | 4 | 3,287 | 4,581 | 5,669 |
| Germania Portland | 1 | 0 | 2 | 4,327 | ..... | 6,671 |
| | 1 | 2 | 4 | 3,587 | 3,522 | 4,562 |
| Alsen's Portland | 1 | 0 | 2 | 4,087 | ..... | 6,382 |
| | 1 | 2 | 4 | 3,233 | 3,426 | 4,963 |

Size of specimens, 12-inch cubes.
Gauged length, 5″.

| Marks. | Brand of cement. | Composition. | | | Age. | | Modulus of elasticity between loads per square inch of— | | | Permanent sets after loads per square inch of— | | | Compressive strength per square inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | | 100 and 600. | 100 and 1,000. | 1,000 and 2,000. | 600. | 1,000. | 2,000. | |
| | | | | | *Mos.* | *Days.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Pounds.* |
| A 58 | Saylor's Portland | 1 | 2 | 4 | ..... | 9 | 1,667,000 | 1,667,000 | ..... | .0025 | .0063 | ..... | 1,944 |
| 61 | do | 1 | 2 | 4 | 1 | ..... | 2,500,000 | 2,500,000 | ..... | .0001 | .0012 | ..... | 2,119 |
| 65 | do | 1 | 2 | 4 | 3 | ..... | 3,571,000 | 3,461,000 | 1,667,000 | .0002 | .0005 | .0040 | 2,778 |
| 60 | do | 1 | 2 | 4 | 6 | ..... | 5,000,000 | 4,500,000 | 2,631,000 | .0002 | .0004 | .0011 | 3,959 |
| A 22 | do | 1 | 3 | 6 | ..... | 9 | 2,273,000 | 1,956,000 | ..... | .0006 | .0021 | ..... | 2,308 |
| 15 | do | 1 | 3 | 6 | 1 | ..... | 2,778,000 | 3,214,000 | 2,083,000 | 0003 | .0007 | .0024 | 2,600 |
| 17 | do | 1 | 3 | 6 | 3 | ..... | 4,167,000 | 3,750,000 | 2,778,000 | 0. | 0. | .0009 | 2,805 |
| 14 | do | 1 | 3 | 6 | 6 | ..... | 2,500,000 | 2,812,000 | 2,000,000 | .0001 | .0005 | .0022 | 3,743 |
| A 44 | do | 1 | 6 | 12 | ..... | 9 | ..... | ..... | ..... | .0120 | ..... | ..... | 795 |
| 37 | do | 1 | 6 | 12 | 1 | ..... | 833,000 | ..... | ..... | .0095 | ..... | ..... | 880 |
| 32 | do | 1 | 6 | 12 | 3 | ..... | 2,273,000 | 1,875,000 | ..... | .0011 | .0026 | ..... | 1,210 |
| 35 | do | 1 | 6 | 12 | 6 | ..... | 2,083,000 | 1,781,000 | ..... | .0002 | .0022 | ..... | 1,471 |
| B 49 | Atlas Portland | 1 | 2 | 4 | ..... | 8 | 2,778,000 | 1,875,000 | ..... | .0006 | .0031 | ..... | 1,695 |
| 60 | do | 1 | 2 | 4 | 1 | ..... | 3,125,000 | 2,812,000 | 1,724,000 | .0001 | .0004 | .0040 | 2,373 |
| 66 | do | 1 | 2 | 4 | 3 | ..... | 4,167,000 | 3,214,000 | 2,083,000 | .0001 | .0002 | .0010 | 2,918 |
| 62 | do | 1 | 2 | 4 | 6 | ..... | 3,125,000 | 3,214,000 | 2,273,000 | .0001 | .0004 | .0013 | 4,000 |
| B 15 | Atlas Portland | 1 | 3 | 6 | ..... | 8 | 1,667,000 | ..... | ..... | .0039 | ..... | ..... | 1,283 |
| 14 | do | 1 | 3 | 6 | 1 | ..... | 3,125,000 | 2,647,000 | ..... | .0001 | .0008 | ..... | 2,097 |
| 9 | do | 1 | 3 | 6 | 3 | ..... | 2,778,000 | 2,500,000 | 1,471,000 | .0002 | .0007 | .0048 | 2,800 |
| 10 | do | 1 | 3 | 6 | 6 | ..... | 3,571,000 | 3,461,000 | 2,174,000 | .0001 | .0003 | .0027 | 3,256 |
| B 40 | do | 1 | 6 | 12 | ..... | 8 | ..... | ..... | ..... | .0156 | ..... | ..... | 642 |
| 34 | do | 1 | 6 | 12 | 1 | ..... | 1,316,000 | ..... | ..... | .0023 | ..... | ..... | 1,100 |
| 36 | do | 1 | 6 | 12 | 3 | ..... | 1,136,000 | 833,000 | ..... | .0039 | .0135 | ..... | 1,324 |
| 28 | do | 1 | 6 | 12 | 6 | ..... | 1,786,000 | 1,607,000 | ..... | .0008 | .0030 | ..... | 1,795 |
| C 73 | Alpha Portland | 1 | 0 | 2 | ..... | 7 | 2,273,000 | 2,143,000 | 1,613,000 | .0008 | .0010 | .0043 | 3,211 |
| 83 | do | 1 | 0 | 2 | 1 | ..... | 3,125,000 | 3,000,000 | 2,941,000 | .0001 | .0003 | .0010 | 4,766 |
| 87 | do | 1 | 0 | 2 | 3 | ..... | 5,000,000 | 4,500,000 | 2,941,000 | .0001 | .0004 | .0008 | 4,841 |

## THE ELASTIC PROPERTIES OF CONCRETE—Continued.

| Marks | Brand of cement. | Composition | | | Age. | | Modulus of elasticity between loads per square inch of— | | | Permanent sets after loads per square inch of— | | | Compressive strength per square inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | | 100 and 600. | 100 and 1,000. | 1,000 and 2,000. | 600. | 1,000. | 2,000. | |
| | | | | | *Mos.* | *Days.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Pounds.* |
| C 57 | Alpha Portland | 1 | 2 | 4 | ..... | 7 | 1,000,000 | ..... | ..... | .0137 | ..... | ..... | 962 |
| 66 | .....do | 1 | 2 | 4 | 1 | ..... | 2,083,000 | 1,875,000 | 1,190,000 | .0006 | .0016 | .0088 | 2,590 |
| 62 | .....do | 1 | 2 | 4 | 3 | ..... | 4,167,000 | 3,750,000 | 2,778,000 | .0001 | .0002 | .0011 | 3,226 |
| 90 | .....do | 1 | 2 | 4 | 6 | ..... | 3,125,000 | 3,214,000 | 3,571,000 | .0001 | .0003 | .0009 | 4,847 |
| C 22 | .....do | 1 | 3 | 6 | 1 | ..... | 2,083,000 | 2,143,000 | ..... | .0006 | .0016 | ..... | 2,364 |
| 21 | .....do | 1 | 3 | 6 | 3 | ..... | 3,571,000 | 2,812,000 | 2,000,000 | .0001 | .0002 | .0016 | 2,880 |
| 3 | .....do | 1 | 3 | 6 | 6 | ..... | 4,167,000 | 4,091,000 | 1,724,000 | .0001 | .0004 | .0022 | 2,627 |
| C 31 | .....do | 1 | 6 | 12 | 1 | ..... | 1,667,000 | 1,607,000 | ..... | .0017 | .0030 | ..... | 1,452 |
| 42 | .....do | 1 | 6 | 12 | 3 | ..... | 1,786,000 | 1,800,000 | ..... | .0012 | .0036 | ..... | 1,677 |
| 43 | .....do | 1 | 6 | 12 | 6 | ..... | 1,923,000 | 1,667,000 | ..... | .0007 | .0020 | ..... | 2,055 |
| D 76 | Germania Portland | 1 | 0 | 2 | ..... | 7 | 2,083,000 | 1,607,000 | 1,087,000 | .0004 | .0012 | .0086 | 2,638 |
| 67 | .....do | 1 | 0 | 2 | 1 | ..... | 3,571,000 | 3,214,000 | 2,778,000 | 0. | .0003 | .0011 | 3,600 |
| 82 | .....do | 1 | 0 | 2 | 3 | ..... | 2,778,000 | 2,500,000 | 1,724,000 | .0008 | .0007 | .0024 | 3,800 |
| 111 | .....do | 1 | 0 | 2 | 6 | ..... | 3,571,000 | 3,461,000 | 2,381,000 | .0002 | .0004 | .0009 | 4,978 |
| D 59 | .....do | 1 | 2 | 4 | ..... | 7 | 2,500,000 | 2,143,000 | 1,351,000 | .0003 | .0012 | .0072 | 2,400 |
| 64 | .....do | 1 | 2 | 4 | 1 | ..... | ..... | ..... | ..... | 0. | ..... | .0020 | 2,933 |
| 53 | .....do | 1 | 2 | 4 | 3 | ..... | 3,571,000 | 3,214,000 | 2,381,000 | 0. | .0001 | .0018 | 3,157 |
| 96 | .....do | 1 | 2 | 4 | 6 | ..... | 4,167,000 | 3,750,000 | 1,852,000 | .0002 | .0004 | .0020 | 3,309 |
| D 11 | .....do | 1 | 3 | 6 | ..... | 7 | 2,273,000 | 1,607,000 | ..... | .0009 | .0049 | ..... | 1,386 |
| 19 | .....do | 1 | 3 | 6 | 1 | ..... | 2,273,000 | 1,875,000 | 1,219,000 | .0006 | .0015 | .0101 | 2,431 |
| 17 | .....do | 1 | 3 | 6 | 3 | ..... | 2,778,000 | 2,812,000 | 2,083,000 | .0002 | .0008 | .0037 | 2,651 |
| 8 | .....do | 1 | 3 | 6 | 6 | ..... | 3,125,000 | 3,000,000 | 1,852,000 | .0001 | .0005 | .0028 | 3,207 |
| D 35 | .....do | 1 | 6 | 12 | ..... | 7 | ..... | ..... | ..... | .0175 | ..... | ..... | 754 |
| 31 | .....do | 1 | 6 | 12 | 1 | ..... | 961,000 | ..... | ..... | .0082 | .0134 | ..... | 1,088 |
| 25 | .....do | 1 | 6 | 12 | 3 | ..... | 2,083,000 | 1,667,000 | ..... | .0011 | .0028 | ..... | 1,276 |
| 40 | .....do | 1 | 6 | 12 | 6 | ..... | 1,786,000 | 1,364,000 | ..... | .0024 | .0059 | ..... | 1,097 |
| E 73 | Alsen's Portland | 1 | 0 | 2 | ..... | 10 | 2,500,000 | 2,368,000 | 1,515,000 | .0002 | .0007 | .0038 | 3,279 |
| 88 | .....do | 1 | 0 | 2 | 1 | ..... | 2,273,000 | 1,956,000 | 1,429,000 | .0002 | .0009 | .0035 | 3,420 |
| 85 | .....do | 1 | 0 | 2 | 3 | ..... | 2,273,000 | 2,250,000 | 1,515,000 | .0003 | .0008 | .0020 | 3,144 |
| 112 | .....do | 1 | 0 | 2 | 6 | ..... | 3,571,000 | 3,214,000 | 2,273,000 | .0003 | .0006 | .0012 | 5,360 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E 49 | do | 1 | 2 | 4 | | 10 | 2,500,000 | 2,143,000 | | .0004 | .0017 | | 1,862 |
| 67 | do | 1 | 2 | 4 | 1 | | 2,778,000 | 2,647,000 | 1,471,000 | .0002 | .0007 | .0054 | 2,373 |
| 56 | do | 1 | 2 | 4 | 3 | | 2,778,000 | 2,500,000 | 1,389,000 | .0003 | .0006 | .0039 | 2,600 |
| 94 | do | 1 | 2 | 4 | 6 | | 4,167,000 | 4,091,000 | 2,631,000 | .0003 | .0005 | .0013 | 3,800 |
| E 5 | do | 1 | 3 | 6 | | 10 | 1,667,000 | 1,452,000 | | .0007 | .0045 | | 1,763 |
| 19 | do | 1 | 3 | 6 | 1 | | 2,273,000 | 1,875,000 | | .0004 | .0017 | | 2,146 |
| 15 | do | 1 | 3 | 6 | 3 | | 2,778,000 | 2,500,000 | 1,667,000 | .0002 | .0007 | .0037 | 2,633 |
| 22 | do | 1 | 3 | 6 | 6 | | 3,571,000 | 3,461,000 | 1,724,000 | .0001 | .0004 | .0025 | 3,183 |
| E 26 | do | 1 | 6 | 12 | | 10 | | | | | | | 568 |
| 36 | do | 1 | 6 | 12 | 1 | | 1,562,000 | | | .0037 | | | 944 |
| 41 | do | 1 | 6 | 12 | 3 | | 1,562,000 | 1,154,000 | | .0024 | .0077 | | 1,158 |
| 43 | do | 1 | 6 | 12 | 6 | | 1,786,000 | 1,452,000 | | .0014 | .0043 | | 1,420 |
| C 3 | Alpha Portland[1] | 1 | 0 | 2 | 6 | | 5,000,000 | 4,091,000 | 3,846,000 | .0001 | .0001 | .0006 | 7,113 |

[1] 10-inch cube.

Marks, A–58.
Composition: Saylor's Portland cement, 1; sand, 2; broken stone, 4.
Age, 9 days.
Weight per cubic foot, 148.89 pounds.
Sectional area, 144 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,400 | 100 | 0. | 0. | Initial load. |
| 28,800 | 200 | .0005 | .0002 | |
| 43,200 | 300 | .0012 | .0007 | |
| 57,600 | 400 | .0021 | .0013 | |
| 72,000 | 500 | .0030 | .0019 | |
| 86,400 | 600 | .0040 | .0025 | E=1,667,000 pounds per square inch. |
| 100,800 | 700 | .0050 | .0034 | |
| 115,200 | 800 | .0062 | .0042 | |
| 129,600 | 900 | .0077 | .0053 | |
| 144,000 | 1,000 | .0090 | .0063 | E=1,667,000 pounds per square inch. |
| 172,800 | 1,200 | .0122 | .0087 | First crack. |
| 201,600 | 1,400 | .0154 | .0112 | |
| 230,400 | 1,600 | .0204 | .0151 | |
| 259,200 | 1,800 | .0255 | .0195 | |
| 279,900 | 1,944 | ..... | ..... | Ultimate strength. |

Marks, A–61.
Composition: Saylor's Portland cement, 1; sand, 2; broken stone, 4.
Age, 1 month.
Weight per cubic foot, 150.82 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0001 | 0. | |
| 43,344 | 300 | .0002 | 0. | |
| 57,792 | 400 | .0004 | .0001 | |
| 72,240 | 500 | .0007 | .0001 | |
| 86,688 | 600 | .0011 | .0001 | E=2,500,000 pounds per square inch. |
| 101,136 | 700 | .0013 | .0002 | |
| 115,584 | 800 | .0018 | .0005 | |
| 130,032 | 900 | .0023 | .0008 | |
| 144,480 | 1,000 | .0030 | .0012 | E=2,500,000 pounds per square inch. |
| 173,376 | 1,200 | .0050 | .0025 | |
| 202,272 | 1,400 | .0075 | .0042 | |
| 231,168 | 1,600 | .0109 | .0066 | |
| 260,064 | 1,800 | .0172 | .0115 | First crack. |
| 288,960 | 2,000 | .0272 | .0197 | |
| 306,100 | 2,119 | ..... | ..... | Ultimate strength. |

Marks, A–65.
Composition: Saylor's Portland cement, 1; sand, 2; broken stone, 4.
Age, 3 months.
Weight per cubic foot, 152.40 pounds.
Sectional area, 144.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,472 | 100 | 0. | 0. | Initial load. |
| 28,944 | 200 | .0001 | 0. | |
| 43,416 | 300 | .0004 | .0001 | |
| 57,888 | 400 | .0006 | .0001 | |
| 72,360 | 500 | .0007 | .0001 | |
| 86,832 | 600 | .0009 | .0002 | E=3,571,000 pounds per square inch. |
| 101,304 | 700 | .0011 | .0002 | |
| 115,776 | 800 | .0013 | .0003 | |
| 130,248 | 900 | .0015 | .0004 | |
| 144,720 | 1,000 | .0018 | .0005 | E=3,461,000 pounds per square inch. |
| 173,664 | 1,200 | .0024 | .0007 | |
| 202,608 | 1,400 | .0034 | .0011 | |
| 231,552 | 1,600 | .0046 | .0018 | E=1,667,000 pounds per square inch. |
| 260,496 | 1,800 | .0060 | .0025 | |
| 289,440 | 2,000 | .0083 | .0040 | |
| 308,000 | ..... | ..... | ..... | First crack. |
| 318,384 | 2,200 | .0110 | .0067 | |
| 347,328 | 2,400 | .0142 | .0082 | |
| 376,272 | 2,600 | .0183 | .0114 | |
| 402,000 | 2,778 | ..... | ..... | Ultimate strength. |

Marks, A–60.
Composition: Saylor's Portland cement, 1; sand, 2; broken stone, 4.
Age, 6 months.
Weight per cubic foot, 150.72 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0001 | 0. | |
| 43,344 | 300 | .0003 | 0. | |
| 57,792 | 400 | .0004 | .0001 | |
| 72,240 | 500 | .0006 | .0001 | |
| 86,688 | 600 | .0007 | .0002 | E=5,000,000 pounds per square inch. |
| 101,136 | 700 | .0009 | .0002 | |
| 115,584 | 800 | .0011 | .0003 | |
| 130,032 | 900 | .0012 | .0003 | |
| 144,480 | 1,000 | .0014 | .0004 | E=4,500,000 pounds per square inch. |
| 173,376 | 1,200 | .0019 | .0005 | |
| 202,272 | 1,400 | .0022 | .0006 | |
| 231,168 | 1,600 | .0029 | .0008 | E=2,631,000 pounds per square inch. |
| 260,064 | 1,800 | .0034 | .0010 | |
| 288,960 | 2,000 | .0040 | .0011 | |
| 317,856 | 2,200 | .0047 | .0014 | |
| 346,752 | 2,400 | .0056 | .0019 | |
| 375,648 | 2,600 | .0066 | .0022 | |
| 404,544 | 2,800 | .0079 | .0029 | |
| 433,440 | 3,000 | .0092 | .0035 | |
| 462,336 | 3,200 | .0108 | .0044 | |
| 491,232 | 3,400 | .0125 | .0052 | |
| 520,128 | 3,600 | .0158 | .0076 | First crack. |
| 549,024 | 3,800 | .0192 | .0096 | |
| 572,000 | 3,959 | ..... | ..... | Ultimate strength. |

Marks, A–22.
Composition: Saylor's Portland cement, 1; sand, 3; broken stone, 6.
Age, 9 days.
Sectional area, 145.32 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,582 | 100 | 0. | 0. | Initial load. |
| 29,064 | 200 | .0002 | 0. | |
| 43,596 | 300 | .0004 | .0001 | |
| 58,128 | 400 | .0008 | .0002 | |
| 72,660 | 500 | .0012 | .0003 | |
| 87,192 | 600 | .0017 | .0006 | E=2,273,000 pounds per square inch. |
| 101,724 | 700 | .0022 | .0008 | |
| 116,256 | 800 | .0027 | .0012 | |
| 130,788 | 900 | .0035 | .0016 | |
| 145,320 | 1,000 | .0044 | .0021 | E=1,956,000 pounds per square inch. |
| 174,384 | 1,200 | .0060 | .0032 | |
| 203,448 | 1,400 | .0077 | .0042 | |
| 232,512 | 1,600 | .0096 | .0054 | First crack. |
| 261,576 | 1,800 | .0121 | .0068 | |
| 290,640 | 2,000 | .0150 | .0089 | |
| 319,704 | 2,200 | .0187 | .0114 | |
| 335,400 | 2,308 | ..... | ..... | Ultimate strength. |

Marks, A–15.
Composition: Saylor's Portland cement, 1; sand, 3; broken stone, 6.
Age, 1 month.
Weight per cubic foot, 149.26 pounds.
Sectional area, 144.12 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,412 | 100 | 0. | 0. | Initial load. |
| 28,824 | 200 | .0002 | 0. | |
| 43,236 | 300 | .0004 | .0001 | |
| 57,648 | 400 | .0007 | .0002 | |
| 72,060 | 500 | .0009 | .0003 | |
| 86,472 | 600 | .0012 | .0003 | E=2,778,000 pounds per square inch. |
| 100,884 | 700 | .0014 | .0005 | |
| 115,296 | 800 | .0016 | .0006 | |
| 129,708 | 900 | .0018 | .0007 | |
| 144,120 | 1,000 | .0021 | .0007 | E=3,214,000 pounds per square inch. |
| 172,944 | 1,200 | .0027 | .0009 | |
| 201,768 | 1,400 | .0032 | .0011 | |
| 230,592 | 1,600 | .0040 | .0014 | E=2,083,000 pounds per square inch. |
| 259,416 | 1,800 | .0050 | .0019 | |
| 288,240 | 2,000 | .0062 | .0024 | |
| 317,064 | 2,200 | .0077 | .0034 | First crack. |
| 345,888 | 2,400 | .0097 | .0044 | |
| 374,712 | 2,600 | .0118 | .0055 | Ultimate strength. |

Marks, A–17.
Composition: Saylor's Portland cement, 1; sand, 3; broken stone, 6.
Age, 3 months.
Weight per cubic foot, 151.84 pounds.
Sectional area, 146.89 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,689 | 100 | 0. | 0. | Initial load. |
| 29,378 | 200 | .0001 | 0. | |
| 44,067 | 300 | .0002 | 0. | |
| 58,756 | 400 | .0003 | 0. | |
| 73,445 | 500 | .0004 | 0. | |
| 88,134 | 600 | .0006 | 0. | E = 4,167,000 pounds per square inch. |
| 102,823 | 700 | .0008 | 0. | |
| 117,512 | 800 | .0009 | 0. | |
| 132,201 | 900 | .0010 | 0. | |
| 146,890 | 1,000 | .0012 | 0. | E = 3,750,000 pounds per square inch. |
| 176,268 | 1,200 | .0015 | .0001 | |
| 205,646 | 1,400 | .0020 | .0002 | |
| 235,024 | 1,600 | .0027 | .0005 | E = 2,778,000 pounds per square inch. |
| 264,402 | 1,800 | .0032 | .0007 | |
| 293,780 | 2,000 | .0039 | .0009 | |
| 323,158 | 2,200 | .0046 | .0013 | First crack. |
| 352,536 | 2,400 | .0055 | .0017 | |
| 381,914 | 2,600 | .0067 | .0023 | |
| 411,292 | 2,800 | .0087 | .0034 | |
| 412,000 | 2,805 | ..... | ..... | Ultimate strength. |

Marks, A–14.
Composition: Saylor's Portland cement, 1; sand, 3; broken stone, 6.
Age, 6 months.
Weight per cubic foot, 150.24 pounds.
Sectional area, 145.19 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,519 | 100 | 0. | 0. | Initial load. |
| 29,038 | 200 | .0001 | 0. | |
| 43,557 | 300 | .0003 | 0. | |
| 58,076 | 400 | .0005 | 0. | |
| 72,595 | 500 | .0008 | 0. | |
| 87,114 | 600 | .0011 | .0001 | E=2,500,000 pounds per square inch. |
| 101,633 | 700 | .0013 | .0002 | |
| 116,152 | 800 | .0015 | .0002 | |
| 130,671 | 900 | .0018 | .0003 | |
| 145,190 | 1,000 | .0021 | .0005 | E=2,812,000 pounds per square inch. |
| 174,228 | 1,200 | .0028 | .0007 | |
| 203,266 | 1,400 | .0036 | .0010 | |
| 232,304 | 1,600 | .0044 | .0014 | E=2,000,000 pounds per square inch. |
| 261,342 | 1,800 | .0053 | .0017 | |
| 290,380 | 2,000 | .0063 | .0022 | |
| 319,418 | 2,200 | .0076 | .0027 | |
| 348,456 | 2,400 | .0087 | .0033 | |
| 377,494 | 2,600 | .0103 | .0043 | |
| 406,532 | 2,800 | .0118 | .0053 | First crack. |
| 435,570 | 3,000 | .0137 | .0064 | |
| 464,608 | 3,200 | .0161 | .0080 | |
| 493,646 | 3,400 | .0197 | .0103 | |
| 522,684 | 3,600 | .0246 | ..... | |
| 543,500 | 3,743 | ..... | ..... | Ultimate strength. |

Marks, A–44.
Composition: Saylor's Portland cement, 1; sand, 6; broken stone, 12.
Age, 9 days.
Sectional area, 144.12 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,412 | 100 | 0. | 0. | Initial load |
| 28,824 | 200 | .0016 | .0012 | |
| 43,236 | 300 | .0036 | .0029 | |
| 57,648 | 400 | .0065 | .0051 | |
| 72,060 | 500 | .0100 | .0080 | First crack. |
| 86,472 | 600 | .0149 | .0120 | |
| 100,884 | 700 | .0211 | .0170 | |
| 114,600 | 795 | ..... | ..... | Ultimate strength. |

Marks, A–37.
Composition: Saylor's Portland cement, 1; sand, 6; broken stone, 12.
Age, 1 month.
Sectional area, 144.84 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0007 | .0001 | |
| 43,452 | 300 | .0020 | .0012 | |
| 57,936 | 400 | .0044 | .0031 | |
| 72,420 | 500 | .0077 | .0057 | |
| 86,904 | 600 | .0125 | .0095 | E=833,000 pounds per square inch. |
| 101,388 | 700 | .0182 | .0140 | |
| 115,872 | 800 | .0275 | .0222 | |
| 127,500 | 880 | ..... | ..... | Ultimate strength. |

Marks, A–32.
Composition: Saylor's Portland cement, 1; sand, 6; broken stone, 12.
Age, 3 months.
Sectional area, 145.42 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,542 | 100 | 0. | 0. | Initial load. |
| 29,084 | 200 | .0003 | .0001 | |
| 43,626 | 300 | .0007 | .0002 | |
| 58,168 | 400 | .0012 | .0005 | |
| 72,710 | 500 | .0016 | .0007 | |
| 87,252 | 600 | .0022 | .0011 | E = 2,273,000 pounds per square inch. |
| 101,794 | 700 | .0030 | .0015 | |
| 116,336 | 800 | .0036 | .0020 | |
| 130,878 | 900 | .0043 | .0023 | |
| 145,420 | 1,000 | .0050 | .0026 | E = 1,875,000 pounds per square inch. |
| 160,000 | ..... | ..... | ..... | First crack. |
| 174,504 | 1,200 | .0071 | .0038 | |
| 176,000 | 1,210 | ..... | ..... | Ultimate strength. |

Marks, A–35.
Composition: Saylor's Portland cement, 1; sand, 6; broken stone, 12.
Age, 6 months.
Sectional area, 145.64 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,564 | 100 | 0. | 0. | Initial load. |
| 29,128 | 200 | .0001 | 0. | |
| 43,692 | 300 | .0003 | 0. | |
| 58,256 | 400 | .0007 | .0001 | |
| 72,820 | 500 | .0011 | .0002 | |
| 87,384 | 600 | .0014 | .0002 | E=2,083,000 pounds per square inch. |
| 101,948 | 700 | .0020 | .0005 | |
| 116,512 | 800 | .0027 | .0009 | |
| 131,076 | 900 | .0040 | .0016 | |
| 145,640 | 1,000 | .0048 | .0022 | E=1,751,000 pounds per square inch. |
| 174,768 | 1,200 | .0075 | .0040 | |
| 208,000 | ..... | ..... | ..... | First crack. |
| 214,200 | 1,471 | ..... | ..... | Ultimate strength. |

Marks, B–49.
Composition: Atlas Portland cement, 1; sand, 2; broken stone, 4.
Age, 8 days.
Weight per cubic foot, 151.01 pounds.
Sectional area, 143.04 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,304 | 100 | 0. | 0. | Initial load. |
| 28,608 | 200 | .0001 | 0. | |
| 42,912 | 300 | .0004 | .0001 | |
| 57,216 | 400 | .0007 | .0001 | |
| 71,520 | 500 | .0011 | .0003 | |
| 85,824 | 600 | .0015 | .0006 | E=2,778,000 pounds per square inch. |
| 100,128 | 700 | .0022 | .0009 | |
| 114,432 | 800 | .0030 | .0013 | |
| 128,736 | 900 | .0041 | .0020 | |
| 143,040 | 1,000 | .0055 | .0031 | E=1,875,000 pounds per square inch. |
| 171,648 | 1,200 | .0095 | .0061 | |
| 200,256 | 1,400 | .0154 | .0110 | |
| 228,864 | 1,600 | .0260 | .0201 | |
| 242,400 | 1,695 | ..... | ..... | Ultimate strength. |

Marks, B–60.
Composition: Atlas Portland cement, 1; sand, 2; broken stone, 4.
Age, 1 month.
Weight per cubic foot, 151.11 pounds.
Sectional area, 145.20 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,520 | 100 | 0. | 0. | Initial load. |
| 29,040 | 200 | .0001 | 0. | |
| 43,560 | 300 | .0003 | 0. | |
| 58,080 | 400 | .0005 | 0. | |
| 72,600 | 500 | .0007 | 0. | |
| 87,120 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 101,640 | 700 | .0011 | .0002 | |
| 116,160 | 800 | .0014 | .0003 | |
| 130,680 | 900 | .0017 | .0004 | |
| 145,200 | 1,000 | .0020 | .0004 | E=2,812,000 pounds per square inch. |
| 174,240 | 1,200 | .0026 | .0007 | |
| 203,280 | 1,400 | .0036 | .0011 | |
| 232,320 | 1,600 | .0047 | .0018 | E=1,724,000 pounds per square inch. |
| 261,360 | 1,800 | .0064 | .0027 | |
| 290,400 | 2,000 | .0085 | .0040 | |
| 319,440 | 2,200 | .0123 | .0069 | First crack. |
| 344,500 | 2,373 | ..... | ..... | Ultimate strength. |

Marks, B–66.
Composition: Atlas Portland cement, 1; sand, 2; broken stone, 4.
Age, 3 months.
Weight per cubic foot, 150.16 pounds.
Sectional area, 146.62 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,662 | 100 | 0. | 0. | Initial load. |
| 29,324 | 200 | .0001 | 0. | |
| 43,986 | 300 | .0002 | 0. | |
| 58,648 | 400 | .0003 | 0. | |
| 73,310 | 500 | .0006 | 0. | |
| 87,972 | 600 | .0007 | .0001 | E=4,167,000 pounds per square inch. |
| 102,634 | 700 | .0010 | .0001 | |
| 117,296 | 800 | .0012 | .0001 | |
| 131,958 | 900 | .0014 | .0002 | |
| 146,620 | 1,000 | .0016 | .0002 | E=3,214,000 pounds per square inch. |
| 175,944 | 1,200 | .0021 | .0004 | |
| 205,268 | 1,400 | .0027 | .0006 | |
| 234,592 | 1,600 | .0035 | .0009 | E=2,083,000 pounds per square inch. |
| 263,916 | 1,800 | .0042 | .0010 | |
| 293,240 | 2,000 | .0048 | .0010 | |
| 322,564 | 2,200 | .0059 | .0014 | |
| 351,888 | 2,400 | .0081 | .0030 | |
| 381,212 | 2,600 | .0118 | .0055 | |
| 410,536 | 2,800 | .0199 | .0115 | First crack. |
| 428,000 | 2,918 | ..... | ..... | Ultimate strength. |

Marks, B–62.
Composition: Atlas Portland cement, 1; sand, 2; broken stone, 4.
Age, 6 months.
Weight per cubic foot, 150.06 pounds.
Sectional area, 147.13 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,713 | 100 | 0. | 0. | Initial load. |
| 29,426 | 200 | .0001 | 0. | |
| 44,139 | 300 | .0003 | 0. | |
| 58,852 | 400 | .0005 | 0. | |
| 73,565 | 500 | .0007 | .0001 | |
| 88,278 | 600 | .0009 | .0001 | E = 3,125,000 pounds per square inch. |
| 102,991 | 700 | .0011 | .0001 | |
| 117,704 | 800 | .0013 | .0002 | |
| 132,417 | 900 | .0015 | .0003 | |
| 147,130 | 1,000 | .0018 | .0004 | E = 3,214,000 pounds per square inch. |
| 176,556 | 1,200 | .0023 | .0005 | |
| 205,982 | 1,400 | .0029 | .0007 | |
| 235,408 | 1,600 | .0035 | .0009 | E = 2,273,000 pounds per square inch. |
| 264,834 | 1,800 | .0041 | .0010 | |
| 294,260 | 2,000 | .0049 | .0013 | |
| 323,686 | 2,200 | .0057 | .0017 | |
| 353,112 | 2,400 | .0066 | .0022 | |
| 382,538 | 2,600 | .0077 | .0027 | |
| 411,964 | 2,800 | .0087 | .0032 | |
| 441,390 | 3,000 | .0100 | .0039 | |
| 470,816 | 3,200 | .0112 | .0044 | |
| 500,242 | 3,400 | .0129 | .0053 | |
| 529,668 | 3,600 | .0150 | .0067 | |
| 550,000 | ..... | ..... | ..... | First crack. |
| 559,094 | 3,800 | .0173 | .0082 | |
| 588,520 | 4,000 | .0205 | .0111 | Ultimate strength. |

After releasing the maximum load and determining the set under the initial load, the stress was increased to about 1,600 pounds per square inch, which was sustained for a period of 1 hour. At the end of this time the load was increased, failure occurring under a load of about 3,600 pounds per square inch.

Marks, B–15.
Composition: Atlas Portland cement, 1; sand, 3; broken stone, 6.
Age, 8 days.
Weight per cubic foot, 150.89 pounds.
Sectional area 142.68 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,268 | 100 | 0. | 0. | Initial load. |
| 28,536 | 200 | .0004 | .0002 | |
| 42,804 | 300 | .0010 | .0005 | |
| 57,072 | 400 | .0021 | .0013 | |
| 71,340 | 500 | .0035 | .0024 | |
| 85,608 | 600 | .0054 | .0039 | E=1,667,000 pounds per square inch. |
| 99,876 | 700 | .0078 | .0058 | |
| 114,144 | 800 | .0107 | .0083 | |
| 128,412 | 900 | .0130 | .0102 | |
| 142,680 | 1000 | .0178 | .0143 | First crack. |
| 183,100 | 1283 | ..... | ..... | Ultimate strength. |

Marks, B–14.
Composition: Atlas Portland cement, 1; sand, 3; broken stone, 6.
Age, 1 month.
Weight per cubic foot, 151.18 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0001 | 0. | |
| 43,344 | 300 | .0002 | 0. | |
| 57,792 | 400 | .0004 | .0001 | |
| 72,240 | 500 | .0006 | .0001 | |
| 86,688 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 101,136 | 700 | .0012 | .0002 | |
| 115,584 | 800 | .0015 | .0003 | |
| 130,032 | 900 | .0020 | .0005 | |
| 144,480 | 1,000 | .0025 | .0008 | E=2,647,000 pounds per square inch. |
| 173,376 | 1,200 | .0042 | .0018 | |
| 202,272 | 1,400 | .0064 | .0031 | |
| 231,168 | 1,600 | .0097 | .0055 | |
| 260,064 | 1,800 | .0135 | .0083 | First crack. |
| 288,960 | 2,000 | .0202 | .0133 | |
| 303,000 | 2,097 | ..... | ..... | Ultimate strength. |

Marks, B–9.
Composition: Atlas Portland cement, 1; sand, 3; broken stone, 6.
Age, 3 months.
Weight per cubic foot, 152.15 pounds.
Sectional area, 145.55 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,555 | 100 | 0. | 0. | Initial load. |
| 29,110 | 200 | .0001 | 0. | |
| 43,665 | 300 | .0004 | 0. | |
| 58,220 | 400 | .0006 | .0001 | |
| 72,775 | 500 | .0009 | .0001 | |
| 87,330 | 600 | .0011 | .0002 | E=2,778,000 pounds per square inch. |
| 101,885 | 700 | .0014 | .0004 | |
| 116,440 | 800 | .0017 | .0005 | |
| 130,995 | 900 | .0021 | .0006 | |
| 145,550 | 1,000 | .0025 | .0007 | E=2,500,000 pounds per square inch. |
| 174,660 | 1,200 | .0033 | .0011 | |
| 203,770 | 1,400 | .0044 | .0016 | |
| 232,880 | 1,600 | .0060 | .0026 | E=1,471,000 pounds per square inch. |
| 261,990 | 1,800 | .0080 | .0036 | |
| 291,100 | 2,000 | .0100 | .0048 | |
| 320,210 | 2,200 | .0122 | .0064 | |
| 349,320 | 2,400 | .0157 | .0088 | |
| 370,000 | ..... | ..... | ..... | First crack. |
| 378,430 | 2,600 | .0196 | .0116 | |
| 407,540 | 2,800 | .0269 | .0167 | Ultimate strength. |

Marks, B–10.
Composition: Atlas Portland cement, 1; sand, 3; broken stone, 6.
Age, 6 months.
Weight per cubic foot, 151.34 pounds.
Sectional area, 146.15 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,615 | 100 | 0. | 0. | Initial load. |
| 29,230 | 200 | .0001 | 0. | |
| 43,845 | 300 | .0003 | .0001 | |
| 58,460 | 400 | .0004 | .0001 | |
| 73,075 | 500 | .0006 | .0001 | |
| 87,690 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 102,305 | 700 | .0010 | .0002 | |
| 116,920 | 800 | .0012 | .0002 | |
| 131,535 | 900 | .0014 | .0003 | |
| 146,150 | 1,000 | .0016 | .0003 | E=3,461,000 pounds per square inch. |
| 175,380 | 1,200 | .0021 | .0005 | |
| 204,610 | 1,400 | .0029 | .0008 | |
| 233,840 | 1,600 | .0040 | .0014 | E=2,174,000 pounds per square inch. |
| 263,070 | 1,800 | .0049 | .0018 | |
| 292,300 | 2,000 | .0063 | .0027 | |
| 321,530 | 2,200 | .0082 | .0038 | |
| 350,760 | 2,400 | .0104 | .0051 | |
| 379,990 | 2,600 | .0129 | .0068 | |
| 405,000 | ..... | ..... | ..... | First crack. |
| 409,220 | 2,800 | .0170 | .0097 | |
| 438,450 | 3,000 | .0222 | .0134 | |
| 475,800 | 3,256 | ..... | ..... | Ultimate strength. |

Marks, B–40.
Composition: Atlas Portland cement, 1; sand, 6; broken stone, 12.
Age, 8 days.
Sectional area, 146.52 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,652 | 100 | 0. | 0. | Initial load. |
| 29,304 | 200 | .0029 | .0023 | |
| 43,956 | 300 | .0069 | .0056 | |
| 57,000 | ..... | ..... | ..... | First crack. |
| 58,608 | 400 | .0110 | .0091 | |
| 73,260 | 500 | .0150 | .0125 | |
| 87,912 | 600 | .0196 | .0156 | |
| 94,100 | 642 | ..... | ..... | Ultimate strength. |

Marks, B–34.
Composition: Atlas Portland cement, 1; sand, 6; broken stone, 12.
Age, 1 month.
Sectional area, 146.04 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,604 | 100 | 0. | 0. | Initial load. |
| 29,208 | 200 | .0004 | 0. | |
| 43,812 | 300 | .0010 | .0002 | |
| 58,416 | 400 | .0017 | .0008 | |
| 73,020 | 500 | .0028 | .0014 | |
| 87,624 | 600 | .0042 | .0023 | E=1,316,000 pounds per square inch. |
| 102,228 | 700 | .0060 | .0035 | |
| 116,832 | 800 | .0085 | .0052 | |
| 131,436 | 900 | .0110 | .0071 | |
| 146,040 | 1,000 | .0142 | .0098 | First crack. |
| 160,644 | 1,100 | ..... | ..... | Ultimate strength. |

Marks, B–36.
Composition: Atlas Portland cement, 1; sand, 6; broken stone, 12.
Age, 3 months.
Sectional area, 146.04 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,604 | 100 | 0. | 0. | Initial load. |
| 29,208 | 200 | .0008 | .0004 | |
| 43,812 | 300 | .0017 | .0010 | |
| 58,416 | 400 | .0029 | .0016 | |
| 73,020 | 500 | .0043 | .0026 | |
| 87,624 | 600 | .0061 | .0039 | E=1,136,000 pounds per square inch. |
| 102,228 | 700 | .0085 | .0055 | |
| 116,832 | 800 | .0115 | .0077 | |
| 131,436 | 900 | .0147 | .0102 | |
| 146,040 | 1,000 | .0189 | .0135 | E=833,000 pounds per square inch. |
| 160,644 | 1,100 | .0251 | .0187 | First crack. |
| 193,400 | 1,324 | ..... | ..... | Ultimate strength. |

Marks, B–28.
Composition: Atlas Portland cement, 1; sand, 6; broken stone, 12.
Age, 6 months.
Sectional area, 145.79 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,579 | 100 | 0. | 0. | Initial load. |
| 29,158 | 200 | .0001 | 0. | |
| 43,737 | 300 | .0006 | 0. | |
| 58,316 | 400 | .0011 | .0003 | |
| 72,895 | 500 | .0016 | .0005 | |
| 87,474 | 600 | .0022 | .0008 | E=1,786,000 pounds per square inch. |
| 102,053 | 700 | .0029 | .0011 | |
| 116,632 | 800 | .0037 | .0016 | |
| 131,211 | 900 | .0046 | .0022 | |
| 145,790 | 1,000 | .0058 | .0030 | E=1,607,000 pounds per square inch. |
| 174,948 | 1,200 | .0085 | .0048 | |
| 204,106 | 1,400 | .0119 | .0075 | |
| 233,264 | 1,600 | .0166 | .0109 | |
| 252,000 | ..... | ..... | ..... | First crack. |
| 261,756 | 1,795 | .0229 | .0162 | Ultimate strength. |

Marks, C–73.
Composition: Alpha Portland cement, 1; sand, 0; broken stone, 2.
Age, 7 days.
Weight per cubic foot, 152.83 pounds.
Sectional area, 144.82 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,482 | 100 | 0. | 0. | Initial load. |
| 28,964 | 200 | .0002 | 0. | |
| 43,446 | 300 | .0005 | .0001 | |
| 57,928 | 400 | .0009 | .0002 | |
| 72,410 | 500 | .0012 | .0002 | |
| 86,892 | 600 | .0014 | .0003 | E = 2,273,000 pounds per square inch. |
| 101,374 | 700 | .0019 | .0006 | |
| 115,856 | 800 | .0023 | .0007 | |
| 130,338 | 900 | .0027 | .0008 | |
| 144,820 | 1,000 | .0031 | .0010 | E = 2,143,000 pounds per square inch. |
| 173,784 | 1,200 | .0041 | .0013 | |
| 202,748 | 1,400 | .0052 | .0021 | |
| 231,712 | 1,600 | .0067 | .0028 | E = 1,613,000 pounds per square inch. |
| 260,676 | 1,800 | .0081 | .0036 | |
| 289,640 | 2,000 | .0095 | .0043 | |
| 318,604 | 2,200 | .0109 | .0049 | |
| 347,568 | 2,400 | .0126 | .0059 | First crack. |
| 376,532 | 2,600 | .0144 | .0068 | |
| 405,496 | 2,800 | .0166 | .0080 | |
| 434,460 | 3,000 | .0200 | .0100 | |
| 463,424 | 3,200 | .0370 | ..... | |
| 465,000 | 3,211 | ..... | ..... | Ultimate strength. |

Marks, C–83.
Composition: Alpha Portland cement, 1; sand, 0; broken stone, 2.
Age, 1 month.
Weight per cubic foot, 152.31 pounds.
Sectional area, 143.40 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,340 | 100 | 0. | 0. | Initial load. |
| 28,680 | 200 | .0001 | 0. | |
| 43,020 | 300 | .0003 | 0. | |
| 57,360 | 400 | .0005 | 0. | |
| 71,700 | 500 | .0007 | 0. | |
| 86,040 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 100,380 | 700 | .0011 | .0001 | |
| 114,720 | 800 | .0013 | .0002 | |
| 129,060 | 900 | .0016 | .0003 | |
| 143,400 | 1,000 | .0018 | .0003 | E=3,000,000 pounds per square inch. |
| 172,080 | 1,200 | .0023 | .0005 | |
| 200,760 | 1,400 | .0028 | .0006 | |
| 229,440 | 1,600 | .0034 | .0008 | E=2,941,000 pounds per square inch. |
| 258,120 | 1,800 | .0038 | .0009 | |
| 286,800 | 2,000 | .0042 | .0010 | |
| 315,480 | 2,200 | .0047 | .0011 | |
| 344,160 | 2,400 | .0051 | .0012 | |
| 372,840 | 2,600 | .0057 | .0013 | |
| 401,520 | 2,800 | .0063 | .0016 | |
| 430,200 | 3,000 | .0070 | .0017 | |
| 458,880 | 3,200 | .0077 | .0021 | |
| 487,560 | 3,400 | .0085 | .0023 | |
| 516,240 | 3,600 | .0091 | .0026 | First crack, |
| 14,340 | 100 | ..... | ..... | Rested one hour under this load. |
| 544,920 | 3,800 | .0103 | .0033 | |
| 573,600 | 4,000 | .0114 | .0040 | |
| 602,280 | 4,200 | .0128 | .0046 | |
| 630,960 | 4,400 | .0127 | .0042 | |
| 659,640 | 4,600 | .0128 | .0021 | |
| 683,500 | 4,766 | ..... | ..... | Ultimate strength. |

Marks, C–87.
Composition: Alpha Portland cement, 1; sand, 0; broken stone, 2.
Age, 3 months.
Weight per cubic foot, 151.69 pounds.
Sectional area, 145.41 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,541 | 100 | 0. | 0. | Initial load. |
| 29,082 | 200 | 0. | 0. | |
| 58,164 | 400 | .0003 | 0. | |
| 87,246 | 600 | .0006 | .0001 | E=5,000,000 pounds per square inch. |
| 116,328 | 800 | .0010 | .0002 | |
| 145,410 | 1,000 | .0014 | .0004 | E=4,500,000 pounds per square inch. |
| 174,492 | 1,200 | .0019 | .0005 | |
| 203,574 | 1,400 | .0022 | .0006 | |
| 232,656 | 1,600 | .0026 | .0006 | E=2,941,000 pounds per square inch. |
| 261,738 | 1,800 | .0031 | .0008 | |
| 290,820 | 2,000 | .0035 | .0008 | |
| 319,902 | 2,200 | .0038 | .0009 | |
| 348,984 | 2,400 | .0042 | .0010 | |
| 378,066 | 2,600 | .0046 | .0011 | |
| 407,148 | 2,800 | .0051 | .0012 | |
| 436,230 | 3,000 | .0055 | .0013 | |
| 465,312 | 3,200 | .0060 | .0015 | First crack. |
| 494,394 | 3,400 | .0066 | .0018 | |
| 523,476 | 3,600 | .0072 | .0020 | |
| 552,558 | 3,800 | .0078 | .0020 | |
| 581,640 | 4,000 | .0084 | .0022 | |
| 610,722 | 4,200 | .0091 | .0025 | |
| 639,804 | 4,400 | .0099 | .0029 | |
| 668,886 | 4,600 | .0109 | .0035 | |
| 697,968 | 4,800 | .0110 | .0025 | |
| 704,000 | 4,841 | ..... | ..... | Ultimate strength. |

Marks, C–57.
Composition: Alpha Portland cement, 1; sand, 2; broken stone, 4.
Age, 7 days.
Weight per cubic foot, 147.88 pounds.
Sectional area, 142.80 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,280 | 100 | 0. | 0. | Initial load. |
| 28,560 | 200 | .0012 | .0008 | |
| 42,840 | 300 | .0032 | .0024 | |
| 57,120 | 400 | .0059 | .0048 | |
| 71,400 | 500 | .0102 | .0083 | |
| 85,680 | 600 | .0162 | .0137 | E=1,000,000 pounds per square inch. |
| 99,960 | 700 | .0228 | .0193 | First crack. |
| 114,240 | 800 | .0317 | .0275 | |
| 137,400 | 962 | ..... | ..... | Ultimate strength. |

Marks, C–66.
Composition: Alpha Portland cement, 1; sand, 2; broken stone, 4.
Age, 1 month.
Weight per cubic foot, 145.02 pounds.
Sectional area, 143.88 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,388 | 100 | 0. | 0. | Initial load. |
| 28,776 | 200 | .0004 | .0001 | |
| 43,164 | 300 | .0008 | .0002 | |
| 57,552 | 400 | .0011 | .0003 | |
| 71,940 | 500 | .0014 | .0005 | |
| 86,328 | 600 | .0018 | .0006 | E=2,083,000 pounds per square inch. |
| 100,716 | 700 | .0022 | .0008 | |
| 115,104 | 800 | .0028 | .0011 | |
| 129,492 | 900 | .0033 | .0013 | |
| 143,880 | 1,000 | .0040 | .0016 | E=1,875,000 pounds per square inch. |
| 172,656 | 1,200 | .0054 | .0024 | |
| 201,432 | 1,400 | .0071 | .0034 | E=1,190,000 pounds per square inch. |
| 230,208 | 1,600 | .0093 | .0046 | |
| 258,984 | 1,800 | .0119 | .0064 | |
| 287,760 | 2,000 | .0154 | .0088 | |
| 316,536 | 2,200 | .0195 | .0117 | |
| 343,000 | ..... | ..... | ..... | First crack. |
| 345,312 | 2,400 | .0257 | .0169 | |
| 372,700 | 2,590 | ..... | ..... | Ultimate strength. |

Marks, C–62.
Composition: Alpha Portland cement, 1; sand, 2; broken stone, 4.
Age, 3 months.
Weight per cubic foot, 148.55 pounds.
Sectional area, 142.92 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,292 | 100 | 0. | 0. | Initial load. |
| 28,584 | 200 | .0001 | 0. | |
| 42,876 | 300 | .0002 | 0. | |
| 57,168 | 400 | .0003 | 0. | |
| 71,460 | 500 | .0004 | 0. | |
| 85,752 | 600 | .0007 | .0001 | E = 4,167,000 pounds per square inch. |
| 100,044 | 700 | .0008 | .0001 | |
| 114,336 | 800 | .0010 | .0001 | |
| 128,628 | 900 | .0012 | .0001 | |
| 142,920 | 1,000 | .0014 | .0002 | E = 3,750,000 pounds per square inch. |
| 171,504 | 1,200 | .0018 | .0002 | |
| 200,088 | 1,400 | .0023 | .0004 | |
| 228,672 | 1,600 | .0028 | .0005 | E = 2,778,000 pounds per square inch. |
| 257,256 | 1,800 | .0034 | .0009 | |
| 285,840 | 2,000 | .0041 | .0011 | |
| 314,424 | 2,200 | .0046 | .0013 | |
| 343,008 | 2,400 | .0052 | .0013 | |
| 371,592 | 2,600 | .0058 | .0016 | |
| 400,176 | 2,800 | .0064 | .0017 | |
| 428,760 | 3,000 | .0074 | .0018 | |
| 457,344 | 3,200 | .0092 | .0021 | First crack. |
| 461,000 | 3,226 | ..... | ..... | Ultimate strength. |

Marks, C–90.
Composition: Alpha Portland cement, 1; sand, 2; broken stone, 4.
Age, 6 months.
Weight per cubic foot, 151.64 pounds.
Sectional area, 142.56 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,256 | 100 | 0. | 0. | Initial load. |
| 28,512 | 200 | .0001 | 0. | |
| 42,768 | 300 | .0003 | 0. | |
| 57,024 | 400 | .0005 | 0. | |
| 71,280 | 500 | .0007 | 0. | |
| 85,536 | 600 | .0009 | .0001 | E = 3,125,000 pounds per square inch. |
| 99,792 | 700 | .0011 | .0001 | |
| 114,048 | 800 | .0013 | .0002 | |
| 128,304 | 900 | .0015 | .0003 | |
| 142,560 | 1,000 | .0017 | .0003 | E = 3,214,000 pounds per square inch. |
| 171,072 | 1,200 | .0020 | .0004 | |
| 199,584 | 1,400 | .0023 | .0005 | |
| 228,096 | 1,600 | .0029 | .0007 | E = 3,571,000 pounds per square inch. |
| 256,608 | 1,800 | .0033 | .0008 | |
| 285,120 | 2,000 | .0037 | .0009 | |
| 313,632 | 2,200 | .0042 | .0010 | |
| 342,144 | 2,400 | .0046 | .0011 | |
| 370,656 | 2,600 | .0052 | .0013 | |
| 142,560 | 1,000 | ..... | ..... | Rested 1 hour under this load. |
| 399,168 | 2,800 | .0060 | .0017 | |
| 427,680 | 3,000 | .0067 | .0020 | |
| 456,192 | 3,200 | .0075 | .0023 | |
| 484,704 | 3,400 | .0082 | .0025 | |
| 513,216 | 3,600 | .0092 | .0030 | |
| 518,000 | ..... | ..... | ..... | First crack. |
| 541,728 | 3,800 | .0101 | .0035 | |
| 570,240 | 4,000 | .0112 | .0040 | |
| 598,752 | 4,200 | .0120 | .0042 | |
| 691,000 | 4,847 | ..... | ..... | Ultimate strength. |

Marks, C–22.
Composition: Alpha Portland cement, 1; sand, 3; broken stone, 6.
Age, 1 month.
Weight per cubic foot, 142.78 pounds.
Sectional area, 143.04 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,304 | 100 | 0. | 0. | Initial load. |
| 28,608 | 200 | .0002 | .0001 | |
| 42,912 | 300 | .0007 | .0002 | |
| 57,216 | 400 | .0010 | .0003 | |
| 71,520 | 500 | .0014 | .0006 | |
| 85,824 | 600 | .0018 | .0006 | E = 2,083,000 pounds per square inch. |
| 100,128 | 700 | .0022 | .0009 | |
| 114,432 | 800 | .0027 | .0011 | |
| 128,736 | 900 | .0032 | .0013 | |
| 143,040 | 1,000 | .0037 | .0016 | E = 2,143,000 pounds per square inch. |
| 171,648 | 1,200 | .0049 | .0022 | |
| 200,256 | 1,400 | .0061 | .0028 | |
| 228,864 | 1,600 | .0076 | .0036 | |
| 257,472 | 1,800 | .0094 | .0046 | |
| 286,080 | 2,000 | .0112 | .0055 | First crack. |
| 314,688 | 2,200 | .0135 | .0066 | |
| 338,100 | 2,364 | ..... | ..... | Ultimate strength. |

Marks, C–21.
Composition: Alpha Portland cement, 1; sand, 3; broken stone, 6.
Age, 3 months.
Weight per cubic foot, 145.48 pounds.
Sectional area, 144.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,472 | 100 | 0. | 0. | Initial load. |
| 28,944 | 200 | .0001 | 0. | |
| 43,416 | 300 | .0002 | 0. | |
| 57,888 | 400 | .0004 | 0. | |
| 72,360 | 500 | .0006 | 0. | |
| 86,832 | 600 | .0008 | .0001 | E = 3,571,000 pounds per square inch. |
| 101,304 | 700 | .0010 | .0001 | |
| 115,776 | 800 | .0012 | .0001 | |
| 130,248 | 900 | .0015 | .0002 | |
| 144,720 | 1,000 | .0018 | .0002 | E = 2,812,000 pounds per square inch. |
| 173,664 | 1,200 | .0023 | .0005 | |
| 202,608 | 1,400 | .0031 | .0007 | |
| 231,552 | 1,600 | .0040 | .0011 | E = 2,000,000 pounds per square inch. |
| 260,496 | 1,800 | .0048 | .0013 | |
| 289,440 | 2,000 | .0057 | .0016 | |
| 318,384 | 2,200 | .0068 | .0019 | |
| 347,328 | 2,400 | .0085 | .0027 | First crack. |
| 376,272 | 2,600 | .0104 | .0035 | |
| 405,216 | 2,800 | .0146 | .0055 | |
| 416,800 | 2,880 | ..... | ..... | Ultimate strength. |

Marks, C–3.
Composition: Alpha Portland cement, 1; sand, 3; broken stone 6.
Age, 6 months.
Weight per cubic foot, 146.09 pounds.
Sectional area, 142.80 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,280 | 100 | 0. | 0. | Initial load. |
| 28,560 | 200 | .0001 | 0. | |
| 42,840 | 300 | .0002 | 0. | |
| 57,120 | 400 | .0003 | 0. | |
| 71,400 | 500 | .0005 | .0001 | |
| 85,680 | 600 | .0007 | .0001 | E = 4,167,000 pounds per square inch. |
| 99,960 | 700 | .0009 | .0002 | |
| 114,240 | 800 | .0011 | .0002 | |
| 128,520 | 900 | .0013 | .0003 | |
| 142,800 | 1,000 | .0015 | .0004 | E = 4,091,000 pounds per square inch. |
| 171,360 | 1,200 | .0021 | .0005 | |
| 199,920 | 1,400 | .0028 | .0007 | |
| 228,480 | 1,600 | .0036 | .0011 | E = 1,724,000 pounds per square inch. |
| 257,040 | 1,800 | .0046 | .0015 | |
| 285,600 | 2,000 | .0062 | .0022 | |
| 314,160 | 2,200 | .0084 | .0035 | |
| 340,000 | ..... | ..... | ..... | First crack. |
| 342,720 | 2,400 | .0117 | .0054 | |
| 371,280 | 2,600 | .0174 | .0090 | |
| 375,200 | 2,627 | ..... | ..... | Ultimate strength. |

Marks, C–31.
Composition: Alpha Portland cement, 1; sand, 6; broken stone, 12.
Age, 1 month.
Weight per cubic foot, 139.46 pounds.
Sectional area, 143.52 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,352 | 100 | 0. | 0. | Initial load. |
| 28,704 | 200 | .0005 | .0001 | |
| 43,056 | 300 | .0012 | .0006 | |
| 57,408 | 400 | .0019 | .0009 | |
| 71,760 | 500 | .0025 | .0013 | |
| 86,112 | 600 | .0032 | .0017 | E=1,667,000 pounds per square inch. |
| 100,464 | 700 | .0040 | .0021 | |
| 114,816 | 800 | .0046 | .0025 | |
| 129,168 | 900 | .0052 | .0028 | |
| 143,520 | 1,000 | .0058 | .0030 | E=1,607,000 pounds per square inch. |
| 172,224 | 1,200 | .0069 | .0034 | |
| 181,000 | ..... | ..... | ..... | First crack. |
| 200,928 | 1,400 | .0071 | .0027 | |
| 208,400 | 1,452 | ..... | ..... | Ultimate strength. |

Marks, C–42.
Composition: Alpha Portland cement, 1; sand, 6; broken stone, 12.
Age, 3 months.
Weight per cubic foot, 145.17 pounds.
Sectional area, 142.08 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,208 | 100 | 0. | 0. | Initial load. |
| 28,416 | 200 | .0003 | .0001 | |
| 42,624 | 300 | .0008 | .0003 | |
| 56,832 | 400 | .0013 | .0005 | |
| 71,040 | 500 | .0020 | .0009 | |
| 85,248 | 600 | .0026 | .0012 | E = 1,786,000 pounds per square inch. |
| 99,456 | 700 | .0034 | .0017 | |
| 113,664 | 800 | .0043 | .0022 | |
| 127,872 | 900 | .0051 | .0029 | |
| 142,080 | 1,000 | .0061 | .0036 | E = 1,800,000 pounds per square inch. |
| 170,496 | 1,200 | .0082 | .0049 | |
| 198,912 | 1,400 | .0110 | .0068 | |
| 227,328 | 1,600 | .0161 | .0104 | First crack. |
| 238,200 | 1,677 | ..... | ..... | Ultimate strength. |

Marks, C–43.
Composition: Alpha Portland cement, 1; sand, 6; broken stone, 12.
Age, 6 months.
Weight per cubic foot, 144.34 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0002 | 0. | |
| 43,380 | 300 | .0006 | .0001 | |
| 57,840 | 400 | .0010 | .0002 | |
| 72,300 | 500 | .0014 | .0004 | |
| 86,760 | 600 | .0020 | .0007 | E=1,923,000 pounds per square inch. |
| 101,220 | 700 | .0025 | .0009 | |
| 115,680 | 800 | .0032 | .0012 | |
| 130,140 | 900 | .0039 | .0015 | |
| 144,600 | 1,000 | .0047 | .0020 | E=1,667,000 pounds per square inch. |
| 173,520 | 1,200 | .0066 | .0031 | |
| 202,440 | 1,400 | .0088 | .0044 | |
| 231,360 | 1,600 | .0114 | .0059 | |
| 260,280 | 1,800 | .0146 | .0082 | First crack. |
| 289,200 | 2,000 | .0196 | .0114 | |
| 297,100 | 2,055 | ..... | ..... | Ultimate strength. |

Marks, D–76.
Composition: Germania Portland cement, 1; sand, 0; broken stone, 2.
Age, 7 days.
Weight per cubic foot, 148.12 pounds.
Sectional area, 144 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,400 | 100 | 0. | 0. | Initial load. |
| 28,800 | 200 | .0001 | 0. | |
| 43,200 | 300 | .0004 | 0. | |
| 57,600 | 400 | .0008 | .0001 | |
| 72,000 | 500 | .0012 | .0002 | |
| 86,400 | 600 | .0016 | .0004 | E = 2,083,000 pounds per square inch. |
| 100,800 | 700 | .0021 | .0005 | |
| 115,200 | 800 | .0027 | .0007 | |
| 129,600 | 900 | .0033 | .0010 | |
| 144,000 | 1,000 | .0040 | .0012 | E = 1,607,000 pounds per square inch. |
| 172,800 | 1,200 | .0055 | .0020 | |
| 201,600 | 1,400 | .0078 | .0034 | |
| 230,400 | 1,600 | .0098 | .0045 | E = 1,067,000 pounds per square inch. |
| 259,200 | 1,800 | .0129 | .0062 | |
| 288,000 | 2,000 | .0160 | .0086 | |
| 316,800 | 2,200 | .0214 | .0126 | First crack. |
| 345,600 | 2,400 | .0312 | .0205 | |
| 379,900 | 2,638 | ..... | ..... | Ultimate strength. |

Marks, D–67.
Composition: Germania Portland cement, 1; sand, 0; broken stone, 2.
Age, 1 month.
Weight per cubic foot, 149.52 pounds.
Sectional area, 143.40 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,340 | 100 | 0. | 0. | Initial load. |
| 28,680 | 200 | .0001 | 0. | |
| 43,020 | 300 | .0002 | 0. | |
| 57,360 | 400 | .0003 | 0. | |
| 71,700 | 500 | .0005 | 0. | |
| 86,040 | 600 | .0007 | 0. | E = 3,571,000 pounds per square inch. |
| 100,380 | 700 | .0010 | .0001 | |
| 114,720 | 800 | .0012 | .0001 | |
| 129,060 | 900 | .0015 | .0002 | |
| 143,400 | 1,000 | .0017 | .0003 | E = 3,214,000 pounds per square inch. |
| 172,080 | 1,200 | .0023 | .0004 | |
| 200,760 | 1,400 | .0028 | .0006 | |
| 229,440 | 1,600 | .0034 | .0008 | E = 2,778,000 pounds per square inch. |
| 258,120 | 1,800 | .0038 | .0010 | |
| 286,800 | 2,000 | .0043 | .0011 | |
| 315,480 | 2,200 | .0046 | .0012 | |
| 344,160 | 2,400 | .0050 | .0014 | First crack. |
| 372,840 | 2,600 | .0056 | .0016 | |
| 401,520 | 2,800 | .0062 | .0018 | |
| 430,200 | 3,000 | .0070 | .0021 | |
| 458,880 | 3,200 | .0081 | .0024 | |
| 487,560 | 3,400 | .0098 | .0033 | |
| 516,240 | 3,600 | .0112 | ..... | Ultimate strength. |

Marks, D–82.
Composition: Germania Portland cement, 1; sand, 0; broken stone, 2.
Age, 3 months.
Weight per cubic foot, 150.13 pounds.
Sectional area, 143.76 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,376 | 100 | 0. | 0. | Initial load. |
| 28,752 | 200 | .0002 | 0. | |
| 43,128 | 300 | .0004 | .0001 | |
| 57,504 | 400 | .0007 | .0001 | |
| 71,880 | 500 | .0009 | .0002 | |
| 86,256 | 600 | .0012 | .0003 | E = 2,778,000 pounds per square inch. |
| 100,632 | 700 | .0015 | .0004 | |
| 115,008 | 800 | .0018 | .0006 | |
| 129,384 | 900 | .0022 | .0007 | |
| 143,760 | 1,000 | .0025 | .0007 | E = 2,500,000 pounds per square inch. |
| 172,512 | 1,200 | .0032 | .0009 | |
| 201,264 | 1,400 | .0039 | .0011 | |
| 230,016 | 1,600 | .0050 | .0017 | E = 1,724,000 pounds per square inch. |
| 258,768 | 1,800 | .0059 | .0020 | |
| 287,520 | 2,000 | .0071 | .0024 | |
| 316,272 | 2,200 | .0084 | .0030 | |
| 345,024 | 2,400 | .0101 | .0039 | |
| 373,776 | 2,600 | .0116 | .0047 | First crack. |
| 402,528 | 2,800 | .0136 | .0058 | |
| 431,280 | 3,000 | .0164 | .0075 | |
| 460,032 | 3,200 | .0184 | .0092 | |
| 488,784 | 3,400 | .0208 | .0107 | |
| 517,536 | 3,600 | .0221 | .0117 | |
| 546,288 | 3,800 | ..... | ..... | Ultimate strength. |

Marks, D–111.
Composition: Germania Portland cement, 1; sand, 0; broken stone, 2.
Age, 6 months.
Weight per cubic foot, 149.63 pounds.
Sectional area, 145.44 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,544 | 100 | 0. | 0. | Initial load. |
| 29,088 | 200 | .0002 | 0. | |
| 43,632 | 300 | .0004 | .0001 | |
| 58,176 | 400 | .0006 | .0001 | |
| 72,720 | 500 | .0007 | .0002 | |
| 87,264 | 600 | .0009 | .0002 | E = 3,571,000 pounds per square inch. |
| 101,808 | 700 | .0011 | .0003 | |
| 116,352 | 800 | .0012 | .0003 | |
| 130,896 | 900 | .0014 | .0003 | |
| 145,440 | 1,000 | .0017 | .0004 | E = 3,461,000 pounds per square inch. |
| 174,528 | 1,200 | .0021 | .0004 | |
| 203,616 | 1,400 | .0026 | .0005 | |
| 232,704 | 1,600 | .0032 | .0007 | E = 2,381,000 pounds per square inch. |
| 261,792 | 1,800 | .0038 | .0008 | |
| 290,880 | 2,000 | .0043 | .0009 | |
| 319,968 | 2,200 | .0050 | .0010 | |
| 349,056 | 2,400 | .0059 | .0011 | |
| 378,144 | 2,600 | .0067 | .0013 | |
| 407,232 | 2,800 | .0078 | .0017 | |
| 436,320 | 3,000 | .0086 | .0020 | |
| 465,408 | 3,200 | .0101 | .0027 | |
| 494,496 | 3,400 | .0109 | .0030 | |
| 523,584 | 3,600 | .0124 | .0036 | |
| 552,672 | 3,800 | .0137 | .0042 | First crack. |
| 581,760 | 4,000 | .0150 | .0048 | |
| 610,848 | 4,200 | .0171 | .0067 | |
| 639,936 | 4,400 | .0189 | .0069 | |
| 669,024 | 4,600 | .0222 | .0084 | |
| 724,000 | 4,978 | ..... | ..... | Ultimate strength. |

Marks, D–59.
Composition: Germania Portland cement, 1; sand, 2; broken stone, 4.
Age, 7 days.
Weight per cubic foot, 149.02 pounds.
Sectional area, 145.30 square inches.
Gauged length, 5″.

| Applied load. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,530 | 100 | 0. | 0. | Initial load. |
| 29,060 | 200 | .0001 | 0. | |
| 43,590 | 300 | .0004 | 0. | |
| 58,120 | 400 | .0006 | 0. | |
| 72,650 | 500 | .0010 | .0001 | |
| 87,180 | 600 | .0013 | .0003 | E = 2,500,000 pounds per square inch. |
| 101,710 | 700 | .0017 | .0005 | |
| 116,240 | 800 | .0022 | .0007 | |
| 130,770 | 900 | .0028 | .0010 | |
| 145,300 | 1,000 | .0033 | .0012 | E = 2,143,000 pounds per square inch. |
| 174,360 | 1,200 | .0045 | .0018 | |
| 203,420 | 1,400 | .0061 | .0028 | |
| 232,480 | 1,600 | .0079 | .0038 | E = 1,351,000 pounds per square inch. |
| 261,540 | 1,800 | .0106 | .0054 | |
| 290,600 | 2,000 | .0130 | .0072 | |
| 319,660 | 2,200 | .0161 | .0095 | First crack. |
| 348,768 | 2,400 | ..... | ..... | Ultimate strength. |

Marks, D–64.
Composition: Germania Portland cement, 1; sand, 2; broken stone, 4.
Age, 1 month.
Weight per cubit foot, 149.64 pounds.
Sectional area, 144.82 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,482 | 100 | 0. | 0. | Initial load. |
| 28,964 | 200 | .0001 | 0. | |
| 43,446 | 300 | .0001 | 0. | |
| 57,928 | 400 | .0002 | 0. | |
| 72,410 | 500 | .0002 | 0. | |
| 86,892 | 600 | .0004 | 0. | |
| 101,374 | 700 | .0005 | .0001 | |
| 115,856 | 800 | .0006 | .0001 | |
| 130,338 | 900 | .0007 | .0001 | |
| 144,820 | 1,000 | .0007 | .0000 | |
| 173,784 | 1,200 | .0008 | —.0005 | Micrometer out of order. |
| 202,748 | 1,400 | .0010 | —.0007 | |
| 231,712 | 1,600 | .0011 | —.0010 | Micrometer readjusted. |
| | | .0041 | .0003 | Second loading. |
| 260,676 | 1,800 | .0054 | .0009 | |
| 289,640 | 2,000 | .0072 | .0020 | |
| 318,604 | 2,200 | .0094 | .0033 | |
| 347,568 | 2,400 | .0120 | .0050 | |
| 376,532 | 2,600 | .0160 | .0075 | First crack. |
| 405,496 | 2,800 | .0215 | .0112 | |
| 424,800 | 2,933 | ..... | ..... | Ultimate strength. |

Marks, D–53.
Composition: Germania Portland cement, 1; sand, 2; broken stone, 4.
Age, 3 months.
Weight per cubic foot, 149.91 pounds.
Sectional area, 143.16 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,316 | 100 | 0. | 0. | Initial load. |
| 28,632 | 200 | .0001 | 0. | |
| 42,948 | 300 | .0002 | 0. | |
| 57,264 | 400 | .0003 | 0. | |
| 71,580 | 500 | .0005 | 0. | |
| 85,896 | 600 | .0007 | 0. | E=3,571,000 pounds per square inch. |
| 100,212 | 700 | .0008 | 0. | |
| 114,528 | 800 | .0011 | 0. | |
| 128,844 | 900 | .0013 | .0001 | |
| 143,160 | 1,000 | .0015 | .0001 | E=3,214,000 ponnds per square inch. |
| 171,792 | 1,200 | .0021 | .0003 | |
| 200,424 | 1,400 | .0027 | .0006 | |
| 229,056 | 1,600 | .0036 | .0010 | E=2,381,000 pounds per square inch. |
| 257,688 | 1,800 | .0045 | .0014 | |
| 286,320 | 2,000 | .0063 | .0018 | |
| 314,952 | 2,200 | .0062 | .0022 | |
| 343,584 | 2,400 | .0071 | .0026 | |
| 370,000 | ..... | ..... | ..... | First crack. |
| 372,216 | 2,600 | .0083 | .0033 | |
| 400,848 | 2,800 | .0092 | .0037 | |
| 429,480 | 3,000 | .0108 | .0046 | |
| 452,000 | 3,157 | ..... | ..... | Ultimate strength. |

Marks, D–96.
Composition: Germania Portland cement, 1; sand, 2; broken stone, 4.
Age, 6 months.
Weight per cubic foot, 148.74 pounds.
Sectional area, 141.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,172 | 100 | 0. | 0. | Initial load. |
| 28,344 | 200 | .0001 | 0. | |
| 42,516 | 300 | .0002 | 0. | |
| 56,688 | 400 | .0004 | 0. | |
| 70,860 | 500 | .0006 | .0001 | |
| 85,032 | 600 | .0008 | .0002 | E=4,167,000 pounds per square inch. |
| 99,204 | 700 | .0009 | .0002 | |
| 113,376 | 800 | .0012 | .0003 | |
| 127,548 | 900 | .0014 | .0003 | |
| 141,720 | 1,000 | .0016 | .0004 | E=3,750,000 pounds per square inch. |
| 170,064 | 1,200 | .0022 | .0006 | |
| 198,408 | 1,400 | .0029 | .0008 | |
| 226,752 | 1,600 | .0040 | .0013 | E=1,852,000 pounds per square inch. |
| 255,096 | 1,800 | .0045 | .0015 | |
| 283,440 | 2,000 | .0059 | .0020 | |
| 311,784 | 2,200 | .0072 | .0026 | |
| 340,128 | 2,400 | .0084 | .0035 | |
| 368,472 | 2,600 | .0109 | .0049 | |
| 390,000 | ..... | ..... | ..... | First crack. |
| 396,816 | 2,800 | .0137 | .0066 | |
| 425,160 | 3,000 | .0170 | .0089 | |
| 469,000 | 3,309 | ..... | ..... | Ultimate strength. |

Marks, D–11.
Composition: Germania Portland cement, 1; sand, 3; broken stone, 6.
Age, 7 days.
Weight per cubic foot, 145.74 pounds.
Sectional area, 143.15 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,315 | 100 | 0. | 0. | Initial load. |
| 28,630 | 200 | .0001 | 0. | |
| 42,945 | 300 | .0005 | .0001 | |
| 57,260 | 400 | .0009 | .0001 | |
| 71,575 | 500 | .0013 | .0005 | |
| 85,890 | 600 | .0020 | .0009 | E=2,273,000 pounds per square inch. |
| 100,205 | 700 | .0030 | .0015 | |
| 114,520 | 800 | .0042 | .0023 | |
| 128,835 | 900 | .0058 | .0035 | |
| 143,150 | 1,000 | .0077 | .0049 | E=1,607,000 pounds per square inch. |
| 171,780 | 1,200 | .0113 | .0076 | |
| 198,400 | 1,386 | ..... | ..... | Ultimate strength. |

Marks, D–19.
Composition: Germania Portland cement, 1; sand, 3; broken stone, 6.
Age, 1 month.
Weight per cubic foot, 148.30 pounds.
Sectional area, 143.99 square inches.
Gauged length, 5.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,399 | 100 | 0. | 0. | Initial load. |
| 28,798 | 200 | .0002 | 0. | |
| 43,197 | 300 | .0006 | .0001 | |
| 57,596 | 400 | .0009 | .0002 | |
| 71,995 | 500 | .0013 | .0002 | |
| 86,394 | 600 | .0016 | .0005 | E=2,273,000 pounds per square inch. |
| 100,793 | 700 | .0021 | .0006 | |
| 115,192 | 800 | .0026 | .0009 | |
| 129,591 | 900 | .0033 | .0011 | |
| 143,990 | 1,000 | .0039 | .0015 | E=1,875,000 pounds per square inch. |
| 172,788 | 1,200 | .0052 | .0021 | |
| 201,586 | 1,400 | .0069 | .0031 | |
| 230,384 | 1,600 | .0088 | .0043 | E=1,219,000 pounds per square inch. |
| 259,182 | 1,800 | .0126 | .0070 | |
| 287,980 | 2,000 | .0166 | .0101 | |
| 290,000 | ..... | ..... | ..... | First crack. |
| 316,778 | 2,200 | .0220 | .0144 | |
| 345,576 | 2,400 | .0311 | .0216 | |
| 350,100 | 2,431 | ..... | ..... | Ultimate strength. |

Marks, D–17.
Composition: Germania Portland cement, 1; sand, 3; broken stone, 6.
Age, 3 months.
Weight per cubic foot, 150.49 pounds.
Sectional area, 144.12 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,412 | 100 | 0. | 0. | Initial load. |
| 28,824 | 200 | .0001 | 0. | |
| 43,236 | 300 | .0003 | 0. | |
| 57,648 | 400 | .0006 | .0001 | |
| 72,060 | 500 | .0008 | .0001 | |
| 86,472 | 600 | .0011 | .0002 | E=2,778,000 pounds per square inch. |
| 100,884 | 700 | .0013 | .0003 | |
| 115,296 | 800 | .0017 | .0005 | |
| 129,708 | 900 | .0020 | .0006 | |
| 144,120 | 1,000 | .0024 | .0008 | E=2,812,000 pounds per square inch. |
| 172,944 | 1,200 | .0032 | .0011 | |
| 201,768 | 1,400 | .0041 | .0016 | |
| 230,592 | 1,600 | .0051 | .0022 | E=2,083,000 pounds per square inch. |
| 259,416 | 1,800 | .0063 | .0029 | |
| 288,240 | 2,000 | .0077 | .0037 | |
| 317,064 | 2,200 | .0092 | .0045 | First crack. |
| 345,888 | 2,400 | .0113 | .0060 | |
| 374,712 | 2,600 | .0137 | .0079 | |
| 382,000 | 2,651 | ..... | ..... | Ultimate strength. |

Marks, D–8.
Composition: Germania Portland cement, 1; sand, 3; broken stone, 6.
Age, 6 months.
Weight per cubic foot, 148.53 pounds.
Sectional area, 146.01 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,601 | 100 | 0. | 0. | Initial load. |
| 29,202 | 200 | .0001 | 0. | |
| 43,803 | 300 | .0002 | 0. | |
| 58,404 | 400 | .0004 | 0. | |
| 73,005 | 500 | .0006 | 0. | |
| 87,606 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 102,207 | 700 | .0011 | .0002 | |
| 116,808 | 800 | .0014 | .0003 | |
| 131,409 | 900 | .0017 | .0004 | |
| 146,010 | 1,000 | .0020 | .0005 | E=3,000,000 pounds per square inch. |
| 175,212 | 1,200 | .0027 | .0007 | |
| 204,414 | 1,400 | .0034 | .0010 | |
| 233,616 | 1,600 | .0043 | .0014 | E=1,852,000 pounds per square inch. |
| 262,818 | 1,800 | .0056 | .0020 | |
| 292,020 | 2,000 | .0070 | .0028 | |
| 321,222 | 2,200 | .0089 | .0039 | |
| 350,424 | 2,400 | .0110 | .0052 | |
| 379,626 | 2,600 | .0139 | .0074 | |
| 408,828 | 2,800 | .0175 | .0098 | |
| 430,000 | ..... | ..... | ..... | First crack. |
| 438,030 | 3,000 | .0229 | .0140 | |
| 468,200 | 3,207 | ..... | ..... | Ultimate strength. |

Marks, D–35.
Composition: Germania Portland cement, 1; sand, 6; broken stone, 12.
Age, 7 days.
Sectional area, 145.56 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,556 | 100 | 0. | 0. | Initial load. |
| 29,112 | 200 | .0016 | .0011 | |
| 43,668 | 300 | .0043 | .0032 | |
| 58,224 | 400 | .0087 | .0068 | |
| 72,780 | 500 | .0140 | .0111 | First crack. |
| 87,336 | 600 | .0213 | .0175 | |
| 109,700 | 754 | ..... | ..... | Ultimate strength. |

Marks, D–31.
Composition: Germania Portland cement, 1; sand, 6; broken stone, 12.
Age, 1 month.
Sectional area, 144.59 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,459 | 100 | 0. | 0. | Initial load. |
| 28,918 | 200 | .0007 | .0003 | |
| 43,377 | 300 | .0015 | .0009 | |
| 57,836 | 400 | .0027 | .0015 | |
| 72,295 | 500 | .0040 | .0025 | |
| 86,754 | 600 | .0058 | .0032 | E=961,000 pounds per square inch. |
| 101,213 | 700 | .0081 | .0062 | |
| 115,672 | 800 | .0105 | .0071 | |
| 130,131 | 900 | .0141 | .0100 | |
| 144,590 | 1,000 | .0187 | .0134 | First crack. |
| 157,300 | 1,088 | .0237 | ..... | Ultimate strength. |

Marks, D–25.
Composition: Germania Portland cement, 1; sand, 6; broken stone, 12.
Age, 3 months.
Sectional area, 142.67 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,267 | 100 | 0. | 0. | Initial load. |
| 28,534 | 200 | .0002 | .0001 | |
| 42,801 | 300 | .0007 | .0002 | |
| 57,068 | 400 | .0012 | .0004 | |
| 71,335 | 500 | .0017 | .0007 | |
| 85,602 | 600 | .0023 | .0011 | E=2,083,000 pounds per square inch. |
| 99,869 | 700 | .0031 | .0015 | |
| 114,136 | 800 | .0039 | .0019 | |
| 128,403 | 900 | .0046 | .0024 | |
| 142,670 | 1,000 | .0055 | .0028 | E=1,667,000 pounds per square inch. |
| 171,204 | 1,200 | .0077 | .0040 | |
| 182,000 | 1,276 | ..... | ..... | Ultimate strength. |

Marks, D–40.
Composition: Germania Portland cement, 1; sand, 6; broken stone, 12.
Age, 6 months.
Sectional area, 141.60 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,160 | 100 | 0. | 0. | Initial load. |
| 28,320 | 200 | .0005 | .0002 | |
| 42,480 | 300 | .0012 | .0007 | |
| 56,640 | 400 | .0020 | .0012 | |
| 70,800 | 500 | .0029 | .0018 | |
| 84,960 | 600 | .0038 | .0024 | E=1,786,000 pounds per square inch. |
| 99,120 | 700 | .0050 | .0032 | |
| 113,280 | 800 | .0065 | .0044 | |
| 127,440 | 900 | .0083 | .0056 | |
| 141,600 | 1,000 | .0102 | .0069 | E=1,364,000 pounds per square inch. |
| 142,000 | ..... | ..... | ..... | First crack. |
| 155,300 | 1,097 | ..... | ..... | Ultimate strength. |

Marks, E–73.
Composition: Alsen's Portland cement, 1; sand, 0; broken stone, 2.
Age, 10 days.
Weight per cubic foot, 147.83 pounds.
Sectional area, 143.64 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,364 | 100 | 0. | 0. | Initial load. |
| 28,728 | 200 | .0001 | 0. | |
| 43,092 | 300 | .0003 | 0. | |
| 57,456 | 400 | .0006 | .0001 | |
| 71,820 | 500 | .0009 | .0002 | |
| 86,184 | 600 | .0012 | .0002 | E=2,500,000 pounds per square inch. |
| 100,548 | 700 | .0015 | .0003 | |
| 114,912 | 800 | .0018 | .0005 | |
| 129,276 | 900 | .0022 | .0006 | |
| 143,640 | 1,000 | .0026 | .0007 | E=2,368,000 pounds per square inch. |
| 172,368 | 1,200 | .0035 | .0011 | |
| 201,096 | 1,400 | .0045 | .0015 | |
| 229,824 | 1,600 | .0057 | .0022 | E=1,515,000 pounds per square inch. |
| 258,552 | 1,800 | .0072 | .0029 | |
| 287,280 | 2,000 | .0090 | .0038 | |
| 316,008 | 2,200 | .0111 | .0051 | |
| 340,000 | ..... | ..... | ..... | First crack. |
| 344,736 | 2,400 | .0137 | .0070 | |
| 373,464 | 2,600 | .0165 | .0091 | |
| 402,192 | 2,800 | .0195 | .0113 | |
| 430,920 | 3,000 | .0243 | .0150 | |
| 471,000 | 3,279 | ..... | ..... | Ultimate strength. |

Marks, E–88.
Composition: Alsen's Portland cement, 1; sand, 0; broken stone, 2.
Age, 1 month.
Weight per cubic foot, 148.03 pounds.
Sectional area, 144.00 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,400 | 100 | 0. | 0. | Initial load. |
| 28,800 | 200 | .0002 | 0. | |
| 43,200 | 300 | .0005 | .0001 | |
| 57,600 | 400 | .0007 | .0001 | |
| 72,000 | 500 | .0010 | .0002 | |
| 86,400 | 600 | .0013 | .0002 | E=2,273,000 pounds per square inch. |
| 100,800 | 700 | .0017 | .0004 | |
| 115,200 | 800 | .0022 | .0006 | |
| 129,600 | 900 | .0026 | .0008 | |
| 144,000 | 1,000 | .0032 | .0009 | E=1,956,000 pounds per square inch. |
| 172,800 | 1,200 | .0043 | .0013 | |
| 201,600 | 1,400 | .0053 | .0017 | |
| 230,400 | 1,600 | .0063 | .0021 | E=1,429,000 pounds per square inch. |
| 259,200 | 1,800 | .0077 | .0025 | |
| 288,000 | 2,000 | .0093 | .0035 | |
| 316,800 | 2,200 | .0111 | .0041 | |
| 345,600 | 2,400 | .0131 | .0055 | |
| 374,400 | 2,600 | .0150 | .0069 | First crack. |
| 403,200 | 2,800 | .0185 | .0091 | |
| 432,000 | 3,000 | .0252 | .0150 | |
| 492,500 | 3,420 | ..... | ..... | Ultimate strength. |

Marks, E–85.
Composition: Alsen's Portland cement, 1; sand, 0; broken stone, 2.
Age, 3 months.
Weight per cubic foot, 150.52 pounds.
Sectional area, 143.03 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,308 | 100 | 0. | 0. | Initial load. |
| 28,606 | 200 | .0001 | 0. | |
| 42,909 | 300 | .0004 | .0001 | |
| 57,212 | 400 | .0008 | .0002 | |
| 71,515 | 500 | .0011 | .0003 | |
| 85,818 | 600 | .0014 | .0003 | E=2,273,000 pounds per square inch. |
| 100,121 | 700 | .0017 | .0004 | |
| 114,424 | 800 | .0020 | .0006 | |
| 128,727 | 900 | .0024 | .0007 | |
| 143,030 | 1,000 | .0028 | .0008 | E=2,250,000 pounds per square inch |
| 171,636 | 1,200 | .0035 | .0009 | |
| 200,242 | 1,400 | .0041 | .0010 | |
| 228,848 | 1,600 | .0047 | .0012 | E=1,515,000 pounds per square inch. |
| 257,454 | 1,800 | .0059 | .0014 | |
| 286,060 | 2,000 | .0073 | .0020 | |
| 314,666 | 2,200 | .0093 | .0030 | First crack. |
| 343,272 | 2,400 | .0119 | .0043 | |
| 371,878 | 2,600 | .0150 | .0059 | |
| 400,484 | 2,800 | .0190 | .0082 | |
| 429,090 | 3,000 | .0275 | .0140 | |
| 449,700 | 3,144 | ..... | ..... | Ultimate strength. |

Marks, E–94.
Composition: Alsen's Portland cement, 1; sand, 2; broken stone, 4.
Age, 6 months.
Weight per cubic foot, 147.97 pounds.
Sectional area, 142.32 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,232 | 100 | 0. | 0. | Initial load. |
| 28,464 | 200 | .0002 | .0001 | |
| 42,696 | 300 | .0003 | .0001 | |
| 56,928 | 400 | .0005 | .0002 | |
| 71,160 | 500 | .0007 | .0002 | |
| 85,392 | 600 | .0009 | .0003 | E=4,167,000 pounds per square inch. |
| 99,624 | 700 | .0010 | .0003 | |
| 113,856 | 800 | .0012 | .0004 | |
| 128,088 | 900 | .0014 | .0004 | |
| 142,320 | 1,000 | .0016 | .0005 | E=4,091,000 pounds per square inch. |
| 170,784 | 1,200 | .0021 | .0006 | |
| 199,248 | 1,400 | .0026 | .0007 | |
| 227,712 | 1,600 | .0031 | .0009 | E=2,631,000 pounds per square inch. |
| 256,176 | 1,800 | .0037 | .0011 | |
| 284,640 | 2,000 | .0043 | .0013 | |
| 313,104 | 2,200 | .0051 | .0017 | |
| 341,568 | 2,400 | .0060 | .0020 | |
| 370,032 | 2,600 | .0070 | .0024 | |
| 398,496 | 2,800 | .0084 | .0031 | |
| 426,960 | 3,000 | .0099 | .0039 | |
| 428,000 | ..... | ..... | ..... | First crack. |
| 455,424 | 3,200 | .0118 | .0050 | |
| 483,888 | 3,400 | .0138 | .0062 | |
| 512,352 | 3,600 | .0167 | .0080 | |
| 540,816 | 3,800 | .0282 | .0157 | Ultimate strength. |

Marks, E–5.
Composition: Alsen's Portland cement, 1; sand, 3; broken stone, 6.
Age, 10 days.
Weight per cubic foot, 148.28 pounds.
Sectional area, 143.75 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,375 | 100 | 0. | 0. | Initial load. |
| 28,750 | 200 | .0001 | 0. | |
| 43,125 | 300 | .0003 | 0. | |
| 57,500 | 400 | .0007 | .0001 | |
| 71,875 | 500 | .0013 | .0003 | |
| 86,250 | 600 | .0022 | .0007 | E=1,667,000 pounds per square inch. |
| 100,625 | 700 | .0033 | .0014 | |
| 115,000 | 800 | .0046 | .0023 | |
| 129,375 | 900 | .0060 | .0033 | |
| 143,750 | 1,000 | .0076 | .0045 | E=1,452,000 pounds per square inch. |
| 172,500 | 1,200 | .0110 | .0068 | |
| 201,250 | 1,400 | .0153 | .0103 | First crack. |
| 230,000 | 1,600 | .0207 | .0146 | |
| 253,400 | 1,763 | ..... | ..... | Ultimate strength. |

Marks, E–19.
Composition: Alsen's Portland cement, 1; sand, 3; broken stone, 6.
Age, 1 month.
Weight per cubic foot, 149.62 pounds.
Sectional area, 141.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,172 | 100 | 0. | 0. | Initial load. |
| 28,344 | 200 | .0002 | 0. | |
| 42,516 | 300 | .0006 | .0001 | |
| 56,688 | 400 | .0008 | .0001 | |
| 70,860 | 500 | .0011 | .0002 | |
| 85,032 | 600 | .0015 | .0004 | E=2,273,000 pounds per square inch. |
| 99,204 | 700 | .0020 | .0007 | |
| 113,376 | 800 | .0026 | .0010 | |
| 127,548 | 900 | .0033 | .0012 | |
| 141,720 | 1,000 | .0041 | .0017 | E=1,875,000 pounds per square inch. |
| 170,064 | 1,200 | .0061 | .0030 | |
| 198,408 | 1,400 | .0085 | .0044 | |
| 226,752 | 1,600 | .0113 | .0064 | |
| 240,000 | ..... | ..... | ..... | First crack. |
| 255,096 | 1,800 | .0141 | .0083 | |
| 283,440 | 2,000 | .0175 | .0109 | |
| 304,100 | 2,146 | ..... | ..... | Ultimate strength. |

Marks, E–15.
Composition: Alsen's Portland cement, 1; sand, 3; broken stone, 6.
Age, 3 months.
Weight per cubic foot, 149.14 pounds.
Sectional area, 144.71 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,471 | 100 | 0. | 0. | Initial load. |
| 28,942 | 200 | .0001 | 0. | |
| 43,413 | 300 | .0004 | 0. | |
| 57,884 | 400 | .0006 | .0001 | |
| 72,355 | 500 | .0009 | .0001 | |
| 86,826 | 600 | .0011 | .0002 | E=2,778,000 pounds per square inch. |
| 101,297 | 700 | .0014 | .0003 | |
| 115,768 | 800 | .0018 | .0005 | |
| 130,239 | 900 | .0021 | .0006 | |
| 144,710 | 1,000 | .0025 | .0007 | E=2,500,000 pounds per square inch. |
| 173,652 | 1,200 | .0033 | .0010 | |
| 202,594 | 1,400 | .0044 | .0015 | |
| 231,536 | 1,600 | .0055 | .0021 | E=1,667,000 pounds per square inch. |
| 260,478 | 1,800 | .0068 | .0027 | |
| 289,420 | 2,000 | .0085 | .0037 | |
| 318,362 | 2,200 | .0102 | .0048 | |
| 347,304 | 2,400 | .0127 | .0064 | First crack. |
| 376,246 | 2,600 | .0171 | .0103 | |
| 381,000 | 2,633 | ..... | ..... | Ultimate strength. |

Marks, E–22.
Composition: Alsen's Portland cement, 1; sand, 3; broken stone, 6.
Age, 6 months.
Weight per cubic foot, 147.24 pounds.
Sectional area, 144.84 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0001 | 0. | |
| 43,452 | 300 | .0002 | 0. | |
| 57,936 | 400 | .0004 | 0. | |
| 72,420 | 500 | .0006 | .0001 | |
| 86,904 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 101,388 | 700 | .0010 | .0002 | |
| 115,872 | 800 | .0012 | .0002 | |
| 130,356 | 900 | .0014 | .0003 | |
| 144,840 | 1,000 | .0017 | .0004 | E=3,461,000 pounds per square inch. |
| 173,808 | 1,200 | .0023 | .0006 | |
| 202,776 | 1,400 | .0032 | .0010 | |
| 231,744 | 1,600 | .0041 | .0013 | E=1,724,000 pounds per square inch. |
| 260,712 | 1,800 | .0053 | .0018 | |
| 289,680 | 2,000 | .0067 | .0025 | |
| 318,648 | 2,200 | .0089 | .0037 | |
| 347,616 | 2,400 | .0108 | .0047 | |
| 376,584 | 2,600 | .0137 | .0067 | |
| 405,552 | 2,800 | .0179 | .0097 | |
| 430,000 | ..... | ..... | ..... | First crack. |
| 434,520 | 3,000 | .0245 | .0145 | |
| 461,000 | 3,183 | ..... | ..... | Ultimate strength. |

Marks, E–26.
Composition: Alsen's Portland cement, 1; sand, 6; broken stone, 12.
Age, 10 days.
Sectional area, 143.99 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,399 | 100 | 0. | 0. | Initial load. |
| 28,798 | 200 | .0021 | .0017 | |
| 43,197 | 300 | .0074 | .0061 | |
| 57,596 | 400 | .0138 | .0119 | |
| 67,600 | ..... | ..... | ..... | First crack. |
| 81,800 | 568 | ..... | ..... | Ultimate strength. |

Marks, E–36.
Composition: Alsen's Portland cement, 1; sand, 6; broken stone, 12.
Age, 1 month.
Sectional area, 144.24 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,424 | 100 | 0. | 0. | Initial load. |
| 28,848 | 200 | .0015 | .0012 | Defective bearing surface, doubtless influencing micrometer readings. |
| 43,272 | 300 | .0029 | .0022 | |
| 57,696 | 400 | .0039 | .0028 | |
| 72,120 | 500 | .0046 | .0034 | |
| 86,544 | 600 | .0053 | .0037 | E = 1,562,000 pounds per square inch. |
| 100,968 | 700 | .0059 | .0041 | First crack. |
| 115,392 | 800 | .0065 | .0044 | |
| 129,816 | 900 | .0076 | .0048 | |
| 136,200 | 944 | ..... | ..... | Ultimate strength. |

Marks, E–41.
Composition: Alsen's Portland cement, 1; sand, 6; broken stone, 12.
Age, 3 months.
Sectional area, 143.39 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,339 | 100 | 0. | 0. | Initial load. |
| 28,678 | 200 | .0005 | .0002 | |
| 43,017 | 300 | .0012 | .0007 | |
| 57,356 | 400 | .0020 | .0011 | |
| 71,695 | 500 | .0028 | .0016 | |
| 86,034 | 600 | .0040 | .0024 | E = 1,562,000 pounds per square inch. |
| 100,373 | 700 | .0055 | .0034 | |
| 114,712 | 800 | .0071 | .0044 | |
| 129,051 | 900 | .0088 | .0056 | |
| 143,390 | 1,000 | .0116 | .0077 | E = 1,154,000 pounds per square inch. |
| 157,729 | 1,100 | .0147 | .0102 | First crack. |
| 166,100 | 1,158 | ..... | ..... | Ultimate strength. |

Marks, E 43.
Composition: Alsen's Portland cement, 1; sand, 6; broken stone, 12.
Age, 6 months.
Sectional area, 143.64 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,364 | 100 | 0. | 0. | Initial load. |
| 28,728 | 200 | .0005 | .0002 | |
| 43,092 | 300 | .0011 | .0005 | |
| 57,456 | 400 | .0016 | .0008 | |
| 71,820 | 500 | .0021 | .0011 | |
| 86,184 | 600 | .0028 | .0014 | E = 1,786,000 pounds per square inch. |
| 100,548 | 700 | .0037 | .0020 | |
| 114,912 | 800 | .0047 | .0026 | |
| 129,276 | 900 | .0060 | .0034 | |
| 143,640 | 1,000 | .0074 | .0043 | E = 1,452,000 pounds per square inch. |
| 172,368 | 1,200 | .0116 | .0076 | |
| 201,096 | 1,400 | .0190 | .0131 | First crack. |
| 204,000 | 1,420 | ..... | ..... | Ultimate strength. |

Marks, C 3.
Composition: Alpha Portland cement, 1; sand, 0; broken stone, 2.
Age, 6 months.
Weight per cubic foot, 149.26 pounds.
Sectional area, 100.80 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 10,080 | 100 | 0. | 0. | Initial load. |
| 20,160 | 200 | 0. | 0. | |
| 30,240 | 300 | .0001 | 0. | |
| 40,320 | 400 | .0003 | 0. | |
| 50,400 | 500 | .0005 | 0. | |
| 60,480 | 600 | .0006 | .0001 | E = 5,000,000 pounds per square inch. |
| 70,560 | 700 | .0008 | .0001 | |
| 80,640 | 800 | .0010 | .0001 | |
| 90,720 | 900 | .0011 | .0001 | |
| 100,800 | 1,000 | .0012 | .0001 | E = 4,091,000 pounds per square inch |
| 120,960 | 1,200 | .0016 | .0002 | |
| 141,120 | 1,400 | .0019 | .0003 | |
| 161,280 | 1,600 | .0022 | .0004 | E = 3,846,000 pounds per square inch. |
| 181,440 | 1,800 | .0026 | .0005 | |
| 201,600 | 2,000 | .0030 | .0006 | |
| 201,600 | 2,000 | .0031 | ..... | Second application of load, which was sustained one hour. |
| 201,600 | 2,000 | .0034 | .0010 | |
| 221,760 | 2,200 | .0037 | .0011 | |
| 241,920 | 2,400 | .0040 | .0011 | |
| 262,080 | 2,600 | .0044 | .0011 | |
| 282,240 | 2,800 | .0049 | .0012 | |
| 302,400 | 3,000 | .0054 | .0015 | |
| 322,560 | 3,200 | .0058 | .0015 | |
| 342,720 | 3,400 | .0062 | .0016 | |
| 362,880 | 3,600 | .0066 | .0018 | |
| 383,040 | 3,800 | .0073 | .0021 | |
| 403,200 | 4,000 | .0079 | .0023 | |
| 423,360 | 4,200 | .0082 | .0025 | |
| 443,520 | 4,400 | .0087 | .0026 | |
| 463,680 | 4,600 | .0092 | .0029 | |
| 483,840 | 4,800 | .0098 | .0030 | |
| 504,000 | 5,000 | .0102 | .0031 | |
| 524,160 | 5,200 | .0107 | .0032 | |
| 544,320 | 5,400 | .0112 | .0034 | First crack. |
| 564,480 | 5,600 | .0119 | .0037 | |
| 584,640 | 5,800 | .0122 | .0038 | |
| 604,800 | 6,000 | .0128 | .0040 | |
| 624,960 | 6,200 | .0132 | .0042 | |
| 645,120 | 6,400 | .0136 | .0044 | |
| 665,280 | 6,600 | .0140 | .0045 | |
| 685,440 | 6,800 | .0145 | .0051 | |
| 705,600 | 7,000 | .0130 | .0044 | |
| 717,000 | 7,113 | ..... | ..... | Ultimate strength. |

# CONCRETE AND MORTAR CUBES

MADE AT

# WATERTOWN ARSENAL.

783

*CHEMICAL ANALYSES OF PORTLAND CEMENTS USED IN WATERTOWN ARSENAL CONCRETE.*

| Cement. | Silica. | Oxide of iron. | Alumina. | Lime. | Magnesia. | Sulphur trioxide. | Manganous oxide. | Carbon dioxide. |
|---|---|---|---|---|---|---|---|---|
| Alpha..... | 20.00 | 2.80 | 10.87 | 58.66 | 3.35 | 1.34 | 0.40 | 2.56 |
| Star..... | 21.78 | 2.50 | 9.47 | 56.34 | 3.61 | 1.91 | 0.50 | 3.94 |
| Standard..... | 22.50 | 2.60 | 11.98 | 51.44 | 3.61 | 1.57 | 0.32 | 5.96 |
| Steel..... | 31.02 | Trace | 14.60 | 42.16 | 4.05 | 3.36 | ..... | 4.81 |
| Alsen ..... | 20.67 | 2.10 | 10.90 | 57.31 | 2.32 | 2.32 | ..... | 4.45 |

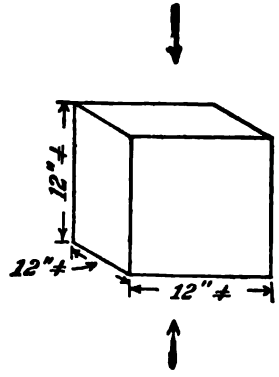
## WEIGHT AND VOLUME OF THE INGREDIENTS AND OF THE RESULTING MORTARS AND CONCRETES.

| Marks on cubes made. | Composition. | | | Brand of cement. | Quantities. | | | | | | Water used. | | | Concrete produced. | | Approximate weight of material when tested, per cent of original mixture. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Cement. | | Sand. | | Stone. | | | | | | | |
| | Cement. | Sand. | Broken stone. | | Volume. | Weight. | Volume. | Weight. | Volume. | Weight. | Volume. | Weight. | Per cent of cement by weight. | Volume. | Per cent of ingredients. | |
| | | | | | *Cub. ft.* | *Pounds.* | *Cub. ft.* | *Pounds.* | *Cub. ft.* | *Pounds.* | *Cub. ft.* | *Pounds.* | *Per cent.* | *Cub ft.* | *Per cent.* | *Per cent.* |
| 1–5 | 1 | 1 | 0 | Alpha Portland | 3 | 305 | 3 | 299½ | 0 | 0 | 1.13 | 70½ | 23.2 | 5.07 | 71.1 | 102.6 |
| 6–10 | 1 | 2 | 0 | do | 2 | 203½ | 4 | 397 | 0 | 0 | 0.90 | 56½ | 27.6 | 5.15 | 74.6 | 105.4 |
| 11–13 | 1 | 3 | 0 | do | 1 | 102½ | 3 | 301½ | 0 | 0 | 0.61 | 38 | 37.1 | 3.37 | 73.1 | 102.4 |
| 14–18 | 1 | 4 | 0 | do | 1 | 101½ | 4 | 398½ | 0 | 0 | 0.78 | 49 | 48.3 | 4.40 | 76.1 | 97.5 |
| 19–24 | 1 | 5 | 0 | do | 1 | 103 | 5 | 503½ | 0 | 0 | 1.07 | 66½ | 64.8 | 5.37 | 75.9 | 95 |
| 25–30 | 1 | 6 | 0 | do | 1 | 102 | 6 | 609½ | 0 | 0 | 0.99 | 62 | 60.8 | 6.07 | 76.0 | 91.9 |
| 31–37 | 1 | 7 | 0 | do | 1 | 95 | 7 | 716½ | 0 | 0 | 1.02 | 63½ | 66.8 | 7.25 | 80.4 | 92.6 |
| 38–42 | 1 | 1 | 0 | Atlas Portland | 3 | 308 | 3 | 307½ | 0 | 0 | 1.41 | 88 | 28.6 | 5.04 | 68.0 | 101.9 |
| 43–47 | 1 | 1 | 0 | Star Portland | 3 | 302½ | 3 | 300 | 0 | 0 | 1.42 | 89 | 29.4 | 5.00 | 67.4 | 96.7 |
| 48–52 | 1 | 1 | 0 | Steel Portland | 3 | 264½ | 3 | 305 | 0 | 0 | 1.42 | 88½ | 33.5 | 5.00 | 67.4 | 95.1 |
| 53–57 | 1 | 1 | 0 | Saylor's Portland | 3 | 291 | 3 | 304½ | 0 | 0 | 1.31 | 82 | 28.1 | 5.00 | 68.4 | 98.7 |
| 58–62 | 1 | 1 | 0 | Germania Portland | 3 | 304½ | 3 | 300½ | 0 | 0 | 1.28 | 80½ | 26.3 | 5.00 | 68.7 | 98.1 |
| 63–67 | 1 | 1 | 0 | Hoffman's Rosendale | 3 | 226½ | 3 | 309 | 0 | 0 | 1.25 | 78½ | 34.5 | 4.71 | 65.0 | 97.4 |
| 68–72 | 1 | 1 | 0 | Norton's Rosendale | 3 | 228½ | 3 | 301 | 0 | 0 | 1.36 | 85½ | 37.3 | 4.65 | 63.2 | 95.1 |
| 73–77 | 1 | [1]1 | 0 | Alpha Portland | 3 | 307½ | 3 | [1]304½ | 0 | 0 | 1.39 | 86½ | 28.2 | 5.10 | 69.0 | 98.5 |
| 78–82 | 1 | [1]2 | 0 | do | 2 | 200½ | 4 | [1]426½ | 0 | 0 | 1.31 | 81½ | 40.7 | 5.25 | 71.8 | 97.1 |
| 83–90 | 1 | 1 | 3—¾″ trap | Alsen's Portland | 2 | 202 | 2 | 209½ | 6 | 589½ | 1.25 | 77 | 38.1 | 7.25 | 64.4 | 99.5 |
| 91–94 | 1 | 2 | 2—1 2½″ trap, 1 ¼″ trap. | Alpha Portland | 1 | 101½ | 2 | 206½ | 2 | 197½ | 0.70 | 43½ | 42.9 | 3.65 | 64.0 | 96.8 |
| 95–99 | 1 | 2 | 3—1¼ 2½″ trap, 1¼ ¼″ trap. | do | 1 | 108 | 2 | 204 | 3 | 298½ | 0.69 | 43 | 41.7 | 4.25 | 63.5 | 97.8 |
| 100–104 | 1 | 2 | 4—2 2½″ trap, 2 ¼″ trap. | do | 1 | 100½ | 2 | 211 | 4 | 406½ | 0.79 | 49½ | 49.1 | 5.00 | 64.2 | 97.0 |
| 105–110 | 1 | 2 | 5—2½ 2½″ trap, 2½ ¼″ trap. | do | 1 | 104 | 2 | 211 | 5 | 519½ | 0.82 | 51½ | 49.8 | 5.75 | 65.2 | 97.1 |
| 111–117 | 1 | 2 | 6—3 2½″ trap, 3 ¼″ trap. | do | 1 | 103½ | 2 | 210½ | 6 | 618½ | 0.90 | 56½ | 54.7 | 6.38 | 64.4 | 97.4 |
| 118–122 | 1 | 2 | 4—2½″ trap | do | 1 | 102½ | 2 | 208 | 4 | 416½ | 0.80 | 50 | 48.9 | 5.00 | 64.1 | 97.1 |
| 123–129 | 1 | 3 | 6—2½″ trap | do | 1 | 105 | 3 | 296½ | 6 | 605½ | 1.13 | 70 | 66.7 | 7.00 | 62.8 | 95.7 |
| 130–134 | 1 | 4 | 8—2½″ trap | do | ½ | 52 | 2 | 201½ | 4 | 408 | 0.72 | 45½ | 87.0 | 4.71 | 70.7 | 95.4 |
| 135–140 | 1 | 5 | 10—2½″ trap | do | ½ | 50½ | 2½ | 258½ | 5 | 506½ | 0.81 | 50½ | 100.0 | 5.77 | 65.5 | 93.9 |
| 141–147 | 1 | 6 | 12—2½″ trap | do | ½ | 51½ | 3 | 295½ | 6 | 614½ | 1.02 | 63½ | 121.4 | 6.87 | 65.3 | 93.0 |
| 148–153 | 1 | 2 | 4—½″ trap | do | 1 | 101½ | 2 | 198½ | 4 | 410½ | 0.90 | 56 | 55.3 | 5.25 | 66.5 | 97.7 |
| 160–167 | 1 | 3 | 6—½″ trap | do | 1 | 102½ | 3 | 289½ | 6 | 614 | 1.16 | 72½ | 71.1 | 7.50 | 67.2 | 97.6 |
| 176–180 | 1 | 4 | 8—½″ trap | do | ½ | 51½ | 2 | 196 | 4 | 404½ | 0.80 | 50 | 76.6 | 5.00 | 68.5 | 95.6 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 186–191 | 1 | 5 | 10—¼" trap | do | ¼ | 52¼ | 2½ | 245 | 5 | 508 | 1.00 | 62½ | 118.5 | 6.00 | 66.7 | 94.0 |
| 196–205 | 1 | 6 | 12—¼" trap | do | ¼ | 52½ | 3 | 294½ | 6 | 601½ | 1.26 | 78½ | 149.5 | 7.27 | 67.6 | 92.9 |
| 214–217 | 1 | 2 | 2—¼" trap | do | 1 | 101½ | 2 | 198 | 2 | 200½ | 0.79 | 49½ | 48.9 | 3.87 | 66.8 | 97.2 |
| 218–222 | 1 | 2 | 3—¼" trap | do | 1 | 102½ | 2 | 190 | 3 | 302½ | 0.81 | 50½ | 49.4 | 4.46 | 65.5 | 97.7 |
| 223–228 | 1 | 2 | 5—¼" trap | do | 1 | 103 | 2 | 198 | 5 | 497½ | 0.94 | 59 | 57.3 | 5.77 | 64.5 | 96.6 |
| 229–235 | 1 | 2 | 6—¼" trap | do | 1 | 102 | 2 | 198 | 6 | 608 | 0.98 | 61½ | 60.8 | 6.67 | 66.8 | 97.9 |
| 236–243 | 1 | 2 | 7—¼" trap | do | 1 | 103½ | 2 | 194½ | 7 | 710 | 1.02 | 63½ | 61.4 | 7.67 | 69.6 | 97.1 |
| 244–248 | 1 | 2 | 8—¼" trap | do | ¼ | 52½ | 1 | 96½ | 4 | 403 | 0.62 | 39 | 74.3 | 4.25 | 69.4 | 97.3 |
| 249–253 | 1 | 2 | 8—¼" trap | do | ¼ | 52½ | 1 | 95½ | 4 | 397 | 0.56 | 35 | 66.7 | 4.25 | 70.5 | 98.2 |
| 254–258 | 1 | 2 | 9—¼" trap | do | ¼ | 52½ | 1 | 99 | 4½ | 449 | 0.62 | 39 | 74.3 | 4.75 | 71.7 | 95.8 |
| 259–263 | 1 | 2 | 9—¼" trap | do | ¼ | 52½ | 1 | 98 | 4½ | 454½ | 0.61 | 38 | 72.4 | 4.67 | 70.6 | 97.1 |
| 264–267 | 1 | 2 | 2—1¼" trap | do | 1 | 100½ | 2 | 194 | 2 | 197½ | 0.76 | 47½ | 47.3 | 3.67 | 68.7 | 94.7 |
| 268–272 | 1 | 2 | 3—1¼" trap | do | 1 | 102 | 2 | 198½ | 3 | 296 | 0.83 | 52 | 51.0 | 4.25 | 62.2 | 95.6 |
| 278–277 | 1 | 2 | 4—1¼" trap | do | 1 | 99 | 2 | 192 | 4 | 394 | 0.88 | 55 | 55.6 | 4.79 | 60.8 | 95.5 |
| 278–283 | 1 | 2 | 5—1¼" trap | do | 1 | 99 | 2 | 189 | 5 | 493½ | 0.74 | 46 | 46.5 | 5.42 | 62.0 | 98.7 |
| 284–289 | 1 | 2 | 6—1¼" trap | do | 1 | 100½ | 2 | 194 | 6 | 589 | 1.04 | 65 | 64.7 | 6.08 | 60.6 | 97.4 |
| 290–296 | 1 | 2 | 7—1¼" trap | do | 1 | 102½ | 2 | 190 | 7 | 688 | 1.15 | 72 | 70.2 | 7.08 | 63.5 | 99.1 |
| 297–300 | 1 | 2 | 8—1¼" trap | do | ¼ | 52½ | 1 | 95½ | 4 | 399 | 0.65 | 40½ | 77.1 | 4.08 | 66.3 | 99.3 |
| 301–304 | 1 | 2 | 8—1¼" trap | do | ¼ | 52½ | 1 | 94½ | 4 | 396½ | 0.60 | 37 | 70.5 | 4.00 | 65.6 | 99.0 |
| 402–406 | 1 | 2 | 4—2½" trap | do | 1 | 99½ | 2 | 200½ | 4 | 403 | 1.01 | 63 | 63.3 | 4.92 | 61.4 | 95.8 |
| 407–411 | 1 | 2 | 4—2½" trap | Steel, Portland | 1 | 83½ | 2 | 198½ | 4 | 394 | 0.86 | 54 | 64.7 | 5.00 | 63.6 | 104.2 |
| 427–431 | 1 | 2 | 4—2½" trap | Norton's Rosendale | 1 | 77 | 2 | 205 | 4 | 410 | 0.86 | 54 | 70.1 | 4.75 | 60.4 | 93.5 |
| 432–436 | 1 | 2 | 0 | do | 2 | 157 | 4 | 404 | 0 | 0 | 1.30 | 81½ | 51.9 | 5.00 | 68.5 | 93.4 |
| 442–446 | 1 | 2 | 4—1¼" to 3" pebbles. | Alpha Portland | 1 | 114 | 2 | 200 | 4 | 406½ | 0.89 | 55½ | 48.7 | 5.00 | 63.4 | 95.9 |
| 452–456 | 1 | 2 | 4—1¼" to 2½" broken brick | do | 1 | 114 | 2 | 195 | 4 | 289½ | 1.18 | 73½ | 64.7 | 5.00 | 61.1 | 97.2 |
| 462–468 | 1 | 3 | 6—1¼" to 2½" broken brick | do | 1 | 113½ | 3 | 295½ | 6 | 416½ | 1.50 | 94 | 82.8 | 6.75 | 58.7 | 95.9 |
| 480–483 | 1 | a 1 | 0 | do | 2 | 225½ | 2 | a 196 | 0 | 0 | 1.18 | 74 | 32.8 | 3.58 | 69.1 | 96.0 |
| 484–486 | 1 | a 2 | 0 | do | 1 | 112 | 2 | a 191 | 0 | 0 | 0.72 | 45 | 40.2 | 2.54 | 68.3 | 98.4 |
| 487–490 | 1 | a 3 | 0 | do | 1 | 111 | 3 | a 284½ | 0 | 0 | 0.94 | 59 | 58.1 | 3.50 | 70.8 | 98.2 |
| 491–495 | 1 | a 2 | 4—2½" trap | do | 1 | 110 | 2 | a 186½ | 4 | 399 | 1.04 | 65 | 59.1 | 4.79 | 59.5 | 96.9 |

a Granite dust.

## Compression Tests.




| Marks. | Brand of cement. | Composition. | | | Age. | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | | *Mos.* | *Lbs.* | *Ozs.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| 1 | Alpha | 1 | 1 | 0 | 4 | 137 | 0 | 137.3 | 11.86 | 12.07 | 12.05 | 145.44 | 732,000 | 732,000 | 5,170 | Cubes Nos. 1 to 18, inclusive, set 1 day in air and 119 days in water. All other cubes of this series were set in air only. |
| 2 | Portland | | | | 4 | 136 | 0 | 135.8 | 11.91 | 12.08 | 12.03 | 145.32 | 558,000 | 558,000 | 3,839 | |
| 3 | | | | | 4 | 135 | 0 | 135.7 | 11.85 | 12.05 | 12.04 | 145.08 | 490,000 | 525,000 | 3,619 | |
| 4 | | | | | 4 | 138 | 0 | 136.9 | 11.95 | 12.05 | 12.10 | 145.80 | 731,000 | 731,000 | 5,014 | |
| 5 | | | | | 4 | 137 | 0 | 136.9 | 11.90 | 12.04 | 12.07 | 145.32 | 612,000 | 612,000 | 4,211 | |
| 6 | Alpha | 1 | 2 | 0 | 4 | 133 | 8 | 134.1 | 11.91 | 12.04 | 12.00 | 144.48 | 369,800 | 369,800 | 2,560 | |
| 7 | Portland | | | | 4 | 135 | 8 | 135.2 | 11.92 | 12.04 | 12.07 | 145.32 | 335,600 | 335,600 | 2,309 | |
| 8 | | | | | 4 | 133 | 0 | 133.8 | 11.87 | 12.03 | 12.03 | 144.72 | 400,400 | 400,400 | 2,767 | |
| 9 | | | | | 4 | 135 | 0 | 133.8 | 11.96 | 12.05 | 12.10 | 145.80 | 362,000 | 362,000 | 2,483 | |
| 10 | | | | | 4 | 135 | 0 | 134.1 | 11.95 | 12.11 | 12.02 | 145.56 | 351,000 | 351,000 | 2,411 | |
| 11 | Alpha | 1 | 3 | 0 | 4 | 134 | 0 | 133.1 | 12.01 | 12.04 | 12.03 | 144.84 | 241,500 | 241,500 | 1,667 | |
| 12 | Portland | | | | 4 | 134 | 0 | 133.9 | 11.93 | 12.05 | 12.03 | 144.96 | 258,500 | 258,500 | 1,783 | |
| 13 | | | | | 4 | 135 | 0 | 134.3 | 11.91 | 12.03 | 12.12 | 145.80 | 289,600 | 289,600 | 1,986 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Alpha | 1 | 4 | 0 | 4 | 120 | 0 | 119.6 | 11.95 | 12.06 | 12.08 | 145.08 | 111,300 | 111,300 | 767 | |
| 15 | Portland | | | | 4 | 120 | 0 | 119.7 | 12.04 | 12.02 | 11.97 | 143.88 | 125,800 | 125,800 | 874 | |
| 18 | | | | | 4 | 125 | 0 | 123.5 | 12.01 | 12.06 | 12.07 | 145.56 | 123,500 | 123,500 | 848 | |
| 19 | Alpha | 1 | 5 | 0 | 4 | 118 | 0 | 118.6 | 11.86 | 12.02 | 12.06 | 144.96 | 82,100 | 82,100 | 566 | |
| 20 | Portland | | | | 4 | 118 | 0 | 118.0 | 11.97 | 12.02 | 12.01 | 144.36 | 68,600 | 68,600 | 475 | |
| 21 | | | | | 4 | 118 | 0 | 119.3 | 11.86 | 12.02 | 11.99 | 144.12 | 64,400 | 64,400 | 447 | |
| 22 | | | | | 4 | 118 | 8 | 118.9 | 12.00 | 12.00 | 11.96 | 143.52 | 63,400 | 63,400 | 442 | |
| 23 | | | | | 4 | 118 | 8 | 118.4 | 11.97 | 12.04 | 12.00 | 144.48 | 68,000 | 68,000 | 471 | |
| 24 | | | | | 4 | 123 | 0 | 122.4 | 11.99 | 12.02 | 12.05 | 144.84 | 113,600 | 115,000 | 794 | |
| 25 | Alpha | 1 | 6 | 0 | 4 | 116 | 12 | 117.8 | 11.90 | 12.02 | 12.02 | 144.48 | 25,100 | 25,100 | 174 | |
| 26 | Portland | | | | 4 | 116 | 12 | 116.4 | 11.90 | 12.07 | 12.07 | 145.68 | 21,600 | 21,600 | 148 | |
| 27 | | | | | 4 | 115 | 12 | 114.8 | 11.95 | 12.10 | 12.05 | 145.80 | 27,400 | 27,400 | 188 | |
| 28 | | | | | 4 | 110 | ..... | Corner gone. | 11.99 | 12.00 | 12.08 | 144.96 | 21,100 | 21,100 | 146 | |
| 29 | | | | | 4 | 118 | ..... | 117.8 | 11.95 | 12.02 | 12.05 | 144.84 | 33,100 | 33,100 | 229 | |
| 30 | | | | | 4 | 118 | 8 | 118.0 | 11.97 | 12.06 | 12.02 | 144.96 | 33,100 | 33,100 | 228 | |
| 31 | Alpha | 1 | 7 | 0 | 4 | 112 | 4 | 112.1 | 11.92 | 12.02 | 12.08 | 145.20 | 17,400 | 17,400 | 120 | |
| 33 | Portland | | | | 4 | 111 | 0 | 110.4 | 12.02 | 12.01 | 12.03 | 144.48 | 14,600 | 14,600 | 101 | |
| 35 | | | | | 4 | 112 | 0 | 111.6 | 11.98 | 12.00 | 12.05 | 144.60 | 21,200 | 21,200 | 147 | |
| 37 | | | | | 4 | 112 | 0 | 111.8 | 11.88 | 12.08 | 12.06 | 145.68 | 15,200 | 15,200 | 104 | |
| 38 | Atlas | 1 | 1 | 0 | 4 | 141 | 8 | 140.9 | 12.02 | 12.01 | 12.02 | 144.36 | 696,000 | 802,000 | 5,555 | |
| 39 | Portland | | | | 4 | 142 | 8 | 142.0 | 11.94 | 12.06 | 12.04 | 145.20 | 755,040 | 809,000 | 5,572 | |
| 40 | | | | | 4 | 142 | 0 | 141.4 | 11.98 | 12.08 | 12.04 | 144.84 | ..... | 810,000 | 5,592 | Sustained load 5 minutes. Test discontinued; cube not fractured. |
| 41 | | | | | 4 | 142 | 8 | 141.7 | 11.99 | 12.07 | 12.01 | 144.96 | 810,000 | 811,000 | 5,595 | Maximum load sustained 8 minutes, load then released to 400,000 pounds and 811,000 pounds again applied. The cube immediately failed upon the second application of this load. |
| 42 | | | | | 4 | 142 | 8 | 141.4 | 11.99 | 12.04 | 12.06 | 145.20 | 804,000 | 804,000 | 5,587 | |
| 43 | Star | 1 | 1 | 0 | 4 | 133 | 8 | 134.5 | 12.03 | 12.02 | 11.86 | 142.56 | 780,000 | 780,000 | 5,471 | |
| 44 | Portland | | | | 4 | 134 | 0 | 134.7 | 11.88 | 12.03 | 12.03 | 144.72 | 761,500 | 761,500 | 5,262 | |
| 45 | | | | | 4 | 134 | 0 | 134.6 | 11.82 | 12.08 | 12.05 | 145.56 | 620,000 | 646,000 | 4,438 | |
| 46 | | | | | 4 | 133 | 8 | 134.7 | 11.88 | 12.00 | 12.01 | 144.12 | 734,000 | 734,000 | 5,093 | |
| 47 | | | | | 4 | 134 | 0 | 134.2 | 11.95 | 12.03 | 12.00 | 144.36 | 716,200 | 716,200 | 4,961 | |
| 48 | Steel | 1 | 1 | 0 | 4 | 124 | 0 | 126.4 | 11.72 | 12.00 | 12.05 | 144.60 | 243,800 | 243,800 | 1,686 | |
| 49 | Portland | | | | 4 | 125 | 8 | 126.1 | 11.92 | 12.01 | 12.01 | 144.24 | 251,500 | 251,500 | 1,744 | |
| 50 | | | | | 4 | 125 | 8 | 127.1 | 11.84 | 12.00 | 12.01 | 144.12 | 262,000 | 262,000 | 1,817 | |
| 51 | | | | | 4 | 125 | 8 | 126.7 | 11.89 | 11.99 | 12.01 | 144.00 | 239,900 | 239,900 | 1,666 | |
| 52 | | | | | 4 | 125 | 8 | 126.6 | 11.89 | 12.00 | 12.01 | 144.12 | 259,416 | 259,416 | 1,800 | |

## Compression Tests—Continued.

| Marks. | Brand of cement. | Composition. | | | Age. | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | | *Mos.* | *Lbs.* | *Ozs.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| 53 | Saylor's | 1 | 1 | 0 | 4 | 134 | 0 | 134.9 | 11.85 | 12.04 | 12.03 | 144.84 | 598,600 | 598,600 | 4,133 | |
| 54 | Portland | | | | 4 | 133 | 0 | 135.0 | 11.80 | 12.00 | 12.02 | 144.24 | 589,800 | 589,800 | 4,089 | |
| 55 | | | | | 4 | 133 | 8 | 134.4 | 11.84 | 12.03 | 12.05 | 144.96 | 552,600 | 552,600 | 3,812 | |
| 56 | | | | | 4 | 133 | 8 | 134.4 | 11.83 | 12.06 | 12.03 | 145.08 | 512,000 | 568,000 | 3,915 | |
| 57 | | | | | 4 | 134 | 8 | 135.1 | 11.88 | 12.05 | 12.02 | 144.84 | 571,400 | 571,400 | 3,945 | |
| 58 | Germania | 1 | 1 | 0 | 4 | 135 | 0 | 134.2 | 11.99 | 12.02 | 12.06 | 144.96 | 613,200 | 613,200 | 4,230 | |
| 59 | Portland | | | | 4 | 134 | 8 | 134.6 | 11.96 | 12.00 | 12.03 | 144.36 | 641,900 | 641,900 | 4,447 | |
| 60 | | | | | 4 | 134 | 0 | 135.0 | 11.83 | 12.03 | 12.05 | 144.96 | 649,700 | 649,700 | 4,482 | |
| 61 | | | | | 4 | 134 | 8 | 134.5 | 11.93 | 12.03 | 12.04 | 144.84 | 646,000 | 646,000 | 4,460 | |
| 62 | | | | | 4 | 134 | 0 | 135.0 | 11.83 | 12.02 | 12.06 | 144.96 | 570,000 | 601,000 | 4,146 | |
| 63 | Hoffman | 1 | 1 | 0 | 4 | 128 | 0 | 127.4 | 11.94 | 12.07 | 12.05 | 145.44 | 114,000 | 115,700 | 795 | |
| 64 | Rosendale | | | | 4 | 125 | 8 | 126.6 | 11.80 | 12.06 | 12.04 | 145.20 | 101,800 | 110,000 | 758 | |
| 65 | | | | | 4 | 128 | 4 | 127.5 | 12.00 | 12.04 | 12.03 | 144.84 | 106,100 | 111,500 | 770 | |
| 66 | | | | | 4 | 127 | 8 | 128.8 | 11.84 | 12.04 | 12.05 | 145.08 | 110,000 | 110,000 | 758 | |
| 67 | | | | | 4 | 126 | 0 | 127.9 | 11.74 | 12.03 | 12.05 | 144.96 | 72,480 | 90,500 | 624 | |
| 68 | Norton | 1 | 1 | 0 | 4 | 126 | 8 | 125.9 | 11.99 | 12.02 | 12.05 | 144.84 | 88,000 | 96,900 | 669 | |
| 69 | Rosendale | | | | 4 | 125 | 0 | 124.0 | 12.00 | 12.05 | 12.05 | 145.20 | 75,800 | 85,400 | 588 | |
| 70 | | | | | 4 | 125 | 8 | 125.6 | 11.92 | 12.04 | 12.03 | 144.84 | 76,800 | 95,800 | 661 | |
| 71 | | | | | 4 | 127 | 0 | 126.3 | 11.96 | 12.04 | 12.07 | 145.32 | 91,000 | 106,000 | 729 | |
| 72 | | | | | 4 | 124 | 8 | 124.1 | 11.99 | 12.01 | 12.04 | 144.60 | 62,000 | 82,100 | 568 | |
| 73 | Alpha | 1 | a1 | 0 | 4 | 135 | 0 | 136.5 | 11.81 | 12.02 | 12.04 | 144.72 | 798,000 | 810,200 | 5,598 | |
| 74 | Portland | | | | 4 | 135 | 0 | 137.3 | 11.74 | 12.05 | 12.01 | 144.72 | 786,000 | 786,000 | 5,431 | |
| 75 | | | | | 4 | 135 | 8 | 137.9 | 11.80 | 12.02 | 11.97 | 143.88 | 770,600 | 770,600 | 5,356 | |
| 76 | | | | | 4 | 135 | 0 | 137.4 | 11.74 | 12.05 | 12.00 | 144.60 | 750,500 | 750,500 | 5,190 | |
| 77 | | | | | 4 | 134 | 8 | 137.3 | 11.69 | 12.05 | 12.02 | 144.84 | 718,000 | 718,000 | 4,957 | |
| 83 | Alsen | 1 | 1 | 3—¾" trap | 4 | 145 | 0 | 145.3 | 11.87 | 12.06 | 12.05 | 145.32 | 265,000 | 265,000 | 1,824 | |
| 84 | Portland | | | | 4 | 147 | 0 | 146.9 | 11.95 | 12.03 | 12.03 | 144.72 | 368,100 | 398,000 | 2,716 | |
| 85 | | | | | 4 | 147 | 0 | 147.3 | 11.93 | 12.10 | 12.05 | 145.80 | 399,800 | 399,800 | 2,742 | |
| 86 | | | | | 4 | 147 | 0 | 148.0 | 11.84 | 12.03 | 12.05 | 144.96 | 439,000 | 441,000 | 3,042 | |
| 87 | | | | | 4 | 146 | 0 | 148.0 | 11.74 | 12.09 | 12.01 | 145.20 | 431,000 | 471,000 | 3,244 | |
| 88 | | | | | 4 | 150 | 8 | 150.4 | 11.95 | 12.04 | 12.02 | 144.72 | 405,216 | 440,000 | 3,040 | |
| 89 | | | | | 4 | 151 | 0 | 152.5 | 11.99 | 11.85 | 12.04 | 142.67 | 593,000 | 593,000 | 4,156 | Tested on edge. |
| 90 | | | | | 4 | 150 | 0 | 151.5 | 12.06 | 11.77 | 12.05 | 141.83 | 518,000 | 549,000 | 3,871 | Do. |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 91 | Alpha | 1 | 2 | 2—2½" trap .. | 4 | 145 | 0 | 145.6 | 11.95 | 12.00 | 12.00 | 144.00 | 398,000 | 417,000 | 2,896 | |
| 92 | Portland | | | ½" trap ... | 4 | 146 | 8 | 146.3 | 11.96 | 12.02 | 12.04 | 144.72 | 410,500 | 413,600 | 2,858 | |
| 93 | | | | | 4 | 145 | 0 | 146.1 | 11.88 | 12.03 | 12.00 | 144.36 | 430,500 | 430,500 | 2,962 | |
| 94 | | | | | 4 | 146 | 0 | 145.6 | 12.00 | 12.02 | 12.01 | 144.36 | 372,000 | 375,336 | 2,600 | |
| 95 | Alpha | 1 | 2 | 3—2½" trap .. | 4 | 148 | 0 | 149.1 | 11.90 | 12.01 | 12.00 | 144.12 | 433,000 | 434,000 | 3,011 | |
| 96 | Portland | | | ½" .trap .. | 4 | 148 | 0 | 147.6 | 11.93 | 12.07 | 12.03 | 145.20 | 348,480 | 348,480 | 2,400 | |
| 97 | | | | | 4 | 146 | 0 | 146.4 | 11.95 | 12.02 | 12.00 | 144.24 | 381,000 | 394,000 | 2,732 | |
| 98 | | | | | 4 | 147 | 8 | 148.6 | 11.89 | 12.00 | 12.02 | 144.24 | 405,000 | 405,000 | 2,808 | |
| 99 | | | | | 4 | 150 | 8 | 151.4 | 11.90 | 12.02 | 12.01 | 144.36 | 430,000 | 447,000 | 3,096 | |
| 100 | Alpha | 1 | 2 | 4—2½" trap .. | 4 | 150 | 0 | 149.6 | 12.00 | 12.02 | 12.01 | 144.36 | 331,000 | 344,000 | 2,383 | |
| 101 | Portland | | | ½" trap ... | 4 | 149 | 8 | 148.4 | 11.98 | 12.06 | 12.05 | 145.32 | 299,000 | 307,100 | 2,113 | |
| 102 | | | | | 4 | 147 | 8 | 148.4 | 11.86 | 12.05 | 12.02 | 144.84 | 260,000 | 324,600 | 2,241 | |
| 103 | | | | | 4 | 147 | 8 | 148.1 | 11.94 | 12.01 | 12.00 | 144.12 | 312,400 | 312,400 | 2,168 | |
| 104 | | | | | 4 | 150 | 8 | 150.4 | 11.98 | 12.02 | 12.01 | 144.36 | 338,500 | 338,500 | 2,345 | |
| 105 | Alpha | 1 | 2 | 5—2½" trap... | 4 | 152 | 0 | 152.1 | 11.92 | 12.05 | 12.02 | 144.84 | 333,700 | 343,000 | 2,368 | |
| 106 | Portland | | | ½" trap.... | 4 | 149 | 0 | 148.9 | 11.98 | 12.01 | 12.02 | 144.36 | 346,464 | 367,000 | 2,542 | |
| 107 | | | | | 4 | 147 | 8 | 148.7 | 11.84 | 12.05 | 12.01 | 144.72 | 331,000 | 345,000 | 2,384 | |
| 108 | | | | | 4 | 150 | 0 | 150.3 | 11.88 | 12.02 | 12.06 | 145.20 | 334,000 | 355,000 | 2,445 | |
| 109 | | | | | 4 | 150 | 0 | 150.3 | 11.91 | 12.03 | 12.04 | 144.84 | 348,500 | 357,000 | 2,465 | |
| 110 | | | | | 4 | 146 | 0 | (b) | 12.08 | 12.02 | 12.01 | 144.36 | 242,000 | 248,600 | 1,722 | |
| 111 | Alpha | 1 | 2 | 6—2½" trap... | 4 | 150 | 0 | 150.4 | 11.96 | 12.00 | 12.01 | 144.12 | 279,000 | 286,000 | 1,984 | |
| 112 | Portland | | | ½" trap.... | 4 | 151 | 0 | 150.2 | 11.99 | 12.01 | 12.06 | 144.84 | 326,000 | 340,000 | 2,347 | |
| 113 | | | | | 4 | 152 | 0 | 152.6 | 11.94 | 12.00 | 12.01 | 144.12 | 358,000 | 358,000 | 2,484 | |
| 114 | | | | | 4 | 152 | 0 | 152.0 | 11.95 | 12.01 | 12.04 | 144.60 | 358,000 | 373,800 | 2,585 | |
| 115 | | | | | 4 | 150 | 8 | 151.3 | 11.88 | 12.03 | 12.00 | 144.96 | 369,000 | 374,000 | 2,580 | |
| 116 | | | | | 4 | 152 | 0 | 151.6 | 11.98 | 12.02 | 12.03 | 144.60 | 372,000 | 373,500 | 2,583 | |
| 117 | | | | | 4 | 149 | 0 | 149.7 | 11.90 | 12.02 | 12.03 | 144.60 | 334,000 | 334,600 | 2,314 | |
| 118 | Alpha | 1 | 2 | 4—2½" trap.... | 4 | 153 | 0 | 152.7 | 11.99 | 12.02 | 12.01 | 144.36 | 276,000 | 387,000 | 1,988 | Voids. |
| 119 | Portland | | | | 4 | 151 | 0 | 150.7 | 12.00 | 12.01 | 12.01 | 144.24 | 284,000 | 317,800 | 2,203 | |
| 120 | | | | | 4 | 147 | 8 | 147.9 | 11.98 | 11.99 | 12.00 | 143.88 | 297,000 | 313,000 | 2,175 | Do. |
| 121 | | | | | 4 | 153 | 0 | 151.9 | 12.01 | 12.05 | 12.03 | 144.96 | 318,912 | 338,300 | 2,334 | Do. |
| 122 | | | | | 4 | 150 | 0 | 150.1 | 11.95 | 12.03 | 12.01 | 144.48 | 304,000 | 316,500 | 2,191 | Do. |
| 123 | Alpha | 1 | 3 | 6—2½" trap.... | 4 | 144 | 0 | 145.1 | 11.86 | 12.03 | 12.02 | 144.60 | 208,000 | 210,000 | 1,452 | Do. |
| 124 | Portland | | | | 4 | 148 | 0 | 146.6 | 12.01 | 12.07 | 12.03 | 145.20 | 241,000 | 242,000 | 1,667 | Do. |
| 125 | | | | | 4 | 143 | 0 | 142.8 | 11.98 | 12.02 | 12.02 | 144.48 | 204,000 | 209,000 | 1,447 | Do. |
| 126 | | | | | 4 | 146 | 8 | 146.1 | 11.98 | 12.02 | 12.03 | 144.60 | 219,000 | 238,300 | 1,648 | Do. |
| 127 | | | | | 4 | 150 | 0 | 150.6 | 11.88 | 12.03 | 12.04 | 144.84 | 260,712 | 279,900 | 1,932 | Voids. |
| 128 | | | | | 4 | 149 | 8 | 149.5 | 12.00 | 11.98 | 12.02 | 144.00 | 235,000 | 267,500 | 1,858 | Tested on edge; voids. |
| 129 | | | | | 4 | 150 | 4 | 148.1 | 12.07 | 12.07 | 12.03 | 145.20 | 203,000 | 247,100 | 1,702 | Do. |
| 130 | Alpha | 1 | 4 | 8—2½" trap.... | 4 | 141 | 0 | 141.8 | 11.86 | 12.05 | 12.02 | 144.84 | 128,000 | 140,400 | 969 | Voids. |
| 131 | Portland | | | | 4 | 143 | 8 | 144.1 | 11.89 | 12.06 | 12.00 | 144.72 | 144,720 | 164,800 | 1,139 | Do. |
| 132 | | | | | 4 | 145 | 0 | 145.5 | 11.89 | 12.01 | 12.06 | 144.84 | 171,000 | 177,800 | 1,227 | Do. |
| 133 | | | | | 4 | 141 | 8 | 141.5 | 11.98 | 12.00 | 12.02 | 144.24 | 136,200 | 140,600 | 975 | Do. |
| 134 | | | | | 4 | 145 | 0 | 143.1 | 12.11 | 12.04 | 12.01 | 144.60 | 173,000 | 197,200 | 1,364 | Do. |

a Granite dust.

b Corner gone.

## Compression Tests—Continued.

| Marks. | Brand of cement. | Composition. | | | Age. | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | | *Mos.* | *Lbs.* | *Ozs.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| 135 | Alpha | 1 | 5 | 10—2½" trap | 4 | 142 | 8 | 141.6 | 12.04 | 12.03 | 12.01 | 144.48 | 99,000 | 116,000 | 808 | Voids. |
| 136 | Portland | | | | 4 | 140 | 0 | 140.2 | 11.92 | 12.05 | 12.01 | 144.72 | 96,000 | 99,200 | 685 | Do. |
| 137 | | | | | 4 | 142 | 0 | 141.4 | 12.04 | 12.00 | 12.01 | 144.12 | 103,000 | 114,000 | 791 | Do. |
| 138 | | | | | 4 | 140 | 8 | 139.0 | 12.07 | 12.03 | 12.03 | 144.72 | 107,800 | 119,000 | 822 | Do. |
| 139 | | | | | 4 | 140 | 0 | 139.1 | 12.01 | 12.05 | 12.01 | 144.72 | 109,000 | 116,700 | 806 | Do. |
| 140 | | | | | 4 | 140 | 12 | 139.6 | 12.01 | 12.04 | 12.05 | 145.08 | 101,556 | 125,600 | 866 | Do. |
| 141 | Alpha | 1 | 6 | 12—2½" trap | 4 | 137 | 8 | 135.9 | 12.10 | 12.03 | 12.01 | 144.48 | 89,000 | 97,300 | 673 | Do. |
| 142 | Portland | | | | 4 | 134 | 8 | 133.9 | 12.06 | 11.97 | 12.02 | 143.88 | 71,000 | 90,400 | 628 | Do. |
| 143 | | | | | 4 | 132 | 8 | 132.1 | 11.98 | 12.03 | 12.03 | 144.72 | 79,800 | 83,100 | 574 | Do. |
| 144 | | | | | 4 | 142 | 12 | 142.0 | 12.03 | 12.02 | 12.02 | 144.48 | 112,000 | 115,700 | 801 | Do. |
| 145 | | | | | 4 | 144 | 4 | 143.9 | 11.95 | 12.01 | 12.07 | 144.96 | 135,600 | 141,300 | 975 | Do. |
| 146 | | | | | 4 | 143 | 8 | 143.3 | 11.99 | 12.00 | 12.03 | 144.36 | 117,200 | 122,000 | 845 | Do. |
| 147 | | | | | 4 | 137 | 0 | 136.4 | 12.01 | 12.02 | 12.02 | 144.48 | 96,000 | 97,100 | 672 | Do. |
| 148 | Alpha | 1 | 2 | 4—½" trap | 4 | 141 | 4 | 142.2 | 11.88 | 12.04 | 12.00 | 144.48 | 276,000 | 276,000 | 1,910 | |
| 149 | Portland | | | | 4 | 141 | 8 | 142.6 | 11.82 | 12.01 | 12.08 | 145.08 | 307,000 | 319,400 | 2,202 | |
| 150 | | | | | 4 | 143 | 0 | 141.8 | 11.97 | 12.04 | 12.01 | 144.60 | 363,000 | 363,000 | 2,510 | |
| 151 | | | | | 4 | 143 | 8 | 143.1 | 11.97 | 12.04 | 12.02 | 144.72 | 298,200 | 298,200 | 2,061 | |
| 152 | | | | | 4 | 142 | 8 | 143.8 | 11.88 | 12.01 | 12.00 | 144.12 | 358,000 | 358,000 | 2,484 | |
| 153 | | | | | 4 | 143 | 8 | 143.1 | 11.99 | 12.00 | 12.04 | 144.48 | 375,648 | 375,648 | 2,600 | |
| 160 | Alpha | 1 | 3 | 6—½" trap | 4 | 140 | 8 | 140.6 | 11.98 | 12.00 | 12.01 | 144.12 | 227,200 | 227,200 | 1,580 | |
| 161 | Portland | | | | 4 | 142 | 8 | 142.7 | 11.93 | 12.03 | 12.02 | 144.60 | 261,000 | 261,000 | 1,805 | |
| 162 | | | | | 4 | 143 | 0 | 142.9 | 11.97 | 12.01 | 12.03 | 144.48 | 292,000 | 292,000 | 2,021 | |
| 163 | | | | | 4 | 139 | 8 | 139.7 | 11.94 | 12.02 | 12.02 | 144.48 | 216,500 | 216,500 | 1,498 | |
| 164 | | | | | 4 | 139 | 8 | 140.0 | 11.89 | 12.01 | 12.06 | 144.84 | 213,600 | 213,600 | 1,475 | |
| 165 | | | | | 4 | 138 | 8 | 138.3 | 11.93 | 12.05 | 12.04 | 145.08 | 220,600 | 220,600 | 1,520 | |
| 166 | | | | | 4 | 140 | 0 | 140.9 | 11.91 | 12.01 | 12.00 | 144.12 | 232,000 | 232,000 | 1,610 | |
| 167 | | | | | 4 | 139 | 8 | 140.2 | 11.90 | 12.02 | 12.02 | 144.48 | 217,000 | 217,000 | 1,502 | |
| 176 | Alpha | 1 | 4 | 8—½" trap | 4 | 135 | 0 | 136.0 | 11.85 | 12.06 | 12.00 | 144.72 | 170,200 | 170,200 | 1,176 | |
| 177 | Portland | | | | 4 | 133 | 8 | 133.7 | 11.96 | 12.02 | 12.00 | 144.24 | 155,400 | 155,400 | 1,077 | |
| 178 | | | | | 4 | 132 | 4 | 132.9 | 11.92 | 12.02 | 12.00 | 144.24 | 132,400 | 132,400 | 918 | |
| 179 | | | | | 4 | 134 | 4 | 135.5 | 11.88 | 12.00 | 12.01 | 144.12 | 144,800 | 144,800 | 1,005 | |
| 180 | | | | | 4 | 136 | 0 | 135.2 | 12.00 | 12.00 | 12.04 | 144.48 | 137,000 | 137,000 | 948 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 186 | Alpha | 1 | 5 | 10—¼" trap | 4 | 136 | 8 | 136.7 | 11.96 | 12.00 | 12.02 | 144.24 | 104,200 | 104,200 | 722 |
| 187 | Portland | | | | 4 | 138 | 0 | 137.5 | 12.02 | 11.98 | 12.04 | 144.24 | 99,700 | 99,900 | 698 |
| 188 | | | | | 4 | 136 | 0 | 135.4 | 11.98 | 12.02 | 12.05 | 144.84 | 94,100 | 94,100 | 650 |
| 189 | | | | | 4 | 132 | 0 | 130.8 | 12.06 | 12.04 | 12.01 | 144.60 | 60,600 | 60,600 | 419 |
| 190 | | | | | 4 | 133 | 4 | 131.5 | 12.07 | 12.04 | 12.05 | 145.08 | 71,200 | 71,200 | 491 |
| 191 | | | | | 4 | 135 | 0 | 134.3 | 12.01 | 12.00 | 12.05 | 144.60 | 107,700 | 107,700 | 745 |
| 198 | Alpha | 1 | 6 | 12—¼" trap | 4 | 128 | 8 | 129.5 | 11.82 | 12.02 | 12.07 | 145.08 | 49,000 | 52,300 | 360 |
| 199 | Portland | | | | 4 | 131 | 0 | 132.4 | 11.80 | 12.07 | 12.00 | 144.84 | 62,700 | 66,400 | 458 |
| 200 | | | | | 4 | 132 | 0 | 132.5 | 11.95 | 12.00 | 12.00 | 144.00 | 58,900 | 65,800 | 457 |
| 202 | | | | | 4 | 128 | 0 | 130.3 | 11.78 | 12.02 | 11.99 | 144.12 | 59,600 | 60,100 | 417 |
| 203 | | | | | 4 | 133 | 0 | 133.7 | 11.92 | 12.00 | 12.02 | 144.24 | 61,700 | 65,900 | 457 |
| 204 | | | | | 4 | 132 | 8 | 133.6 | 11.85 | 12.01 | 12.04 | 144.60 | 76,400 | 79,500 | 550 |
| 205 | | | | | 4 | 134 | 0 | 135.0 | 11.85 | 12.03 | 12.02 | 144.60 | 128,600 | 128,600 | 889 |
| 214 | Alpha | 1 | 2 | 2—¼" trap | 3 | 137 | 4 | 137.5 | 11.96 | 12.00 | 12.02 | 144.24 | 325,200 | 325,200 | 2,255 |
| 215 | Portland | | | | 3 | 136 | 8 | 137.4 | 11.90 | 12.00 | 12.02 | 144.24 | 298,500 | 298,500 | 2,069 |
| 216 | | | | | 3 | 135 | 8 | 136.5 | 11.84 | 12.00 | 12.07 | 144.84 | 305,900 | 305,900 | 2,112 |
| 217 | | | | | 3 | 137 | 4 | 137.7 | 11.85 | 12.02 | 12.09 | 145.32 | 343,600 | 343,600 | 2,364 |
| 218 | Alpha | 1 | 2 | 3—¼" trap | 3 | 139 | 0 | 140.2 | 11.90 | 12.00 | 12.00 | 144.00 | 298,500 | 298,500 | 2,073 |
| 219 | Portland | | | | 3 | 140 | 12 | 141.6 | 11.89 | 12.02 | 12.02 | 144.48 | 314,000 | 314,000 | 2,173 |
| 220 | | | | | 3 | 142 | 0 | 141.6 | 12.00 | 12.08 | 12.00 | 144.36 | 317,400 | 317,400 | 2,199 |
| 221 | | | | | 3 | 142 | 8 | 141.9 | 12.05 | 12.00 | 12.00 | 144.00 | 309,000 | 309,000 | 2,146 |
| 222 | | | | | 3 | 142 | 8 | 143.5 | 11.92 | 12.00 | 12.00 | 144.00 | 309,900 | 309,900 | 2,152 |
| 223 | Alpha | 1 | 2 | 5—¼" trap | 3 | 145 | 0 | 146.2 | 11.90 | 12.02 | 11.98 | 144.00 | 309,800 | 309,800 | 2,151 |
| 224 | Portland | | | | 3 | 144 | 12 | 145.9 | 11.89 | 12.00 | 12.01 | 144.12 | 291,500 | 291,500 | 2,023 |
| 225 | | | | | 3 | 144 | 0 | 145.5 | 11.88 | 12.02 | 11.98 | 144.00 | 319,000 | 323,600 | 2,247 |
| 226 | | | | | 3 | 144 | 8 | 145.2 | 11.89 | 12.01 | 12.04 | 144.60 | 326,000 | 326,000 | 2,254 |
| 227 | | | | | 3 | 144 | 8 | 145.1 | 11.92 | 12.00 | 12.08 | 144.86 | 293,000 | 293,000 | 2,030 |
| 228 | | | | | 3 | 139 | 0 | 140.5 | 11.88 | 12.00 | 11.99 | 143.88 | 263,000 | 263,000 | 1,828 |
| 229 | Alpha | 1 | 2 | 6—¼" trap | 3 | 141 | 0 | 140.6 | 11.98 | 12.02 | 12.03 | 144.60 | 212,000 | 212,000 | 1,466 |
| 230 | Portland | | | | 3 | 145 | 0 | 145.5 | 11.96 | 12.00 | 12.00 | 144.00 | 310,000 | 318,000 | 2,208 |
| 231 | | | | | 3 | 139 | 0 | 139.7 | 11.87 | 12.05 | 12.02 | 144.84 | 231,000 | 231,000 | 1,595 |
| 232 | | | | | 3 | 141 | 4 | 141.3 | 11.96 | 12.08 | 12.01 | 144.48 | 236,700 | 236,700 | 1,638 |
| 233 | | | | | 3 | 139 | 4 | 139.0 | 11.97 | 12.00 | 12.05 | 144.60 | 199,600 | 199,600 | 1,380 |
| 234 | | | | | 3 | 143 | 0 | 142.6 | 11.99 | 12.00 | 12.05 | 144.60 | 204,500 | 204,500 | 1,414 |
| 235 | | | | | 3 | 143 | 0 | 142.9 | 12.00 | 12.08 | 11.98 | 144.12 | 267,100 | 267,100 | 1,858 |
| 236 | Alpha | 1 | 2 | 7—¼" trap | 3 | 142 | 4 | 142.1 | 11.95 | 12.06 | 12.00 | 144.72 | 254,000 | 254,000 | 1,755 |
| 237 | Portland | | | | 3 | 139 | 8 | 138.6 | 11.98 | 12.08 | 12.02 | 145.20 | 233,000 | 233,000 | 1,605 |
| 238 | | | | | 3 | 136 | 0 | 136.6 | 11.85 | 12.04 | 12.06 | 145.20 | 205,500 | 205,500 | 1,415 |
| 239 | | | | | 3 | 133 | 8 | 135.2 | 11.84 | 12.01 | 12.00 | 144.12 | 179,200 | 179,200 | 1,243 |
| 240 | | | | | 3 | 135 | 4 | 136.6 | 11.84 | 12.04 | 12.00 | 144.48 | 190,100 | 190,100 | 1,316 |
| 241 | | | | | 3 | 133 | 8 | 132.9 | 12.04 | 11.98 | 12.08 | 144.12 | 161,000 | 161,000 | 1,117 |
| 242 | | | | | 3 | 132 | 0 | 131.1 | 12.08 | 12.05 | 12.00 | 144.60 | 145,800 | 145,800 | 1,008 |
| 243 | | | | | 3 | 132 | 8 | 132.5 | 11.98 | 12.08 | 11.99 | 144.24 | 141,800 | 141,800 | 983 |

## Compression Tests—Continued.

| Marks. | Brand of Cement. | Composition. | | | Age. | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | | *Mos.* | *Lbs.* | *Ozs.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| 244 | Alpha | 1 | 2 | 8—½" trap | 3 | 132 | 0 | 132.9 | 11.90 | 12.00 | 12.02 | 144.24 | 128,200 | 128,200 | 889 | |
| 245 | Portland | | | | 3 | 134 | 8 | 133.2 | 12.04 | 12.08 | 12.05 | 144.96 | 158,000 | 158,000 | 1,055 | |
| 246 | | | | | 3 | 140 | 0 | 138.2 | 12.14 | 12.01 | 12.01 | 144.24 | 160,600 | 160,600 | 1,113 | |
| 247 | | | | | 3 | 136 | 0 | 136.1 | 11.92 | 12.04 | 12.03 | 144.84 | 177,800 | 177,800 | 1,228 | |
| 248 | | | | | 3 | 134 | 8 | 135.2 | 11.91 | 12.02 | 12.01 | 144.36 | 123,000 | 123,000 | 852 | |
| 249 | Alpha | 1 | 2 | 8—½" trap | 3 | 136 | 4 | 135.8 | 12.00 | 12.01 | 12.03 | 144.48 | 184,100 | 184,100 | 1,274 | |
| 250 | Portland | | | | 3 | 135 | 12 | 134.6 | 12.07 | 12.02 | 12.01 | 144.36 | 179,300 | 179,300 | 1,242 | |
| 251 | | | | | 3 | 133 | 8 | 132.4 | 12.02 | 12.05 | 12.03 | 144.96 | 112,800 | 112,800 | 778 | |
| 252 | | | | | 3 | 131 | 8 | 130.7 | 11.98 | 12.07 | 12.02 | 145.08 | 130,572 | 130,572 | 900 | |
| 253 | | | | | 3 | 133 | 0 | 132.7 | 11.95 | 12.03 | 12.00 | 144.96 | 137,500 | 137,500 | 949 | |
| 254 | Alpha | 1 | 2 | 9—½" trap | 3 | 126 | 12 | 126.9 | 11.93 | 12.06 | 12.00 | 144.72 | 94,400 | 94,400 | 652 | |
| 255 | Portland | | | | 3 | 129 | 0 | 129.2 | 11.98 | 12.00 | 12.00 | 144.00 | 120,200 | 120,200 | 835 | |
| 256 | | | | | 3 | 129 | 8 | 129.2 | 12.01 | 12.02 | 12.00 | 144.24 | 116,300 | 116,300 | 806 | |
| 257 | | | | | 3 | 129 | 8 | 128.4 | 12.01 | 12.01 | 12.03 | 145.08 | 109,700 | 109,700 | 756 | |
| 258 | | | | | 3 | 130 | 0 | 130.4 | 11.95 | 12.01 | 12.00 | 144.12 | 118,100 | 118,100 | 819 | |
| 259 | Alpha | 1 | 2 | 9—½" trap | 3 | 132 | 0 | 133.0 | 11.90 | 12.00 | 12.01 | 144.12 | 126,500 | 126,500 | 878 | |
| 260 | Portland | | | | 3 | 137 | 0 | 136.8 | 11.95 | 12.01 | 12.06 | 144.84 | 144,300 | 144,300 | 996 | |
| 261 | | | | | 3 | 133 | 4 | 133.7 | 11.98 | 12.02 | 12.01 | 144.36 | 104,700 | 104,700 | 725 | |
| 262 | | | | | 3 | 133 | 0 | 131.8 | 12.04 | 12.04 | 12.03 | 144.84 | 129,900 | 129,900 | 897 | |
| 263 | | | | | 3 | 133 | 8 | 133.1 | 12.02 | 12.00 | 12.02 | 144.24 | 115,200 | 115,200 | 799 | |
| 264 | Alpha | 1 | 2 | 2—1½" trap | 3 | 139 | 0 | 140.5 | 11.85 | 12.01 | 12.01 | 144.24 | 263,000 | 263,000 | 1,823 | |
| 265 | Portland | | | | 3 | 137 | 4 | 138.0 | 11.85 | 12.03 | 12.01 | 145.08 | 267,400 | 267,400 | 1,843 | |
| 266 | | | | | 3 | 141 | 4 | 142.1 | 11.91 | 12.00 | 12.02 | 144.24 | 258,500 | 258,500 | 1,792 | |
| 267 | | | | | 3 | 139 | 8 | 140.7 | 11.87 | 12.01 | 12.02 | 144.36 | 229,000 | 233,100 | 1,615 | |
| 268 | Alpha | 1 | 2 | 3—1½" trap | 3 | 142 | 8 | 143.5 | 11.93 | 12.00 | 11.99 | 143.88 | 289,200 | 289,200 | 2,010 | |
| 269 | Portland | | | | 3 | 142 | 8 | 143.0 | 11.93 | 12.01 | 12.02 | 144.36 | 248,300 | 248,300 | 1,720 | |
| 270 | | | | | 3 | 145 | 4 | 145.6 | 11.87 | 12.03 | 12.07 | 145.20 | 269,600 | 269,600 | 1,857 | |
| 271 | | | | | 3 | 147 | 0 | 147.2 | 11.93 | 12.00 | 12.00 | 144.00 | 282,200 | 282,200 | 1,960 | |
| 272 | | | | | 3 | 146 | 8 | 146.9 | 11.93 | 12.00 | 12.04 | 144.48 | 290,200 | 290,200 | 2,009 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 273 | Alpha | 1 | 2 | 4—1½" trap... | 3 | 150 | 8 | 151.8 | 11.87 | 12.02 | 12.01 | 144.36 | 292,000 | 352,000 | 2,438 | |
| 274 | Portland | | | | 3 | 149 | 8 | 151.1 | 11.84 | 12.03 | 12.00 | 144.36 | 288,720 | 317,500 | 2,199 | |
| 275 | | | | | 3 | 146 | 8 | 147.7 | 11.85 | 12.02 | 12.03 | 144.60 | 280,800 | 281,600 | 1,947 | |
| 276 | | | | | 3 | 144 | 0 | 145.8 | 11.78 | 12.05 | 12.02 | 144.84 | 278,000 | 284,000 | 1,961 | |
| 277 | | | | | 3 | 149 | 0 | 149.0 | 11.90 | 12.02 | 12.06 | 145.20 | 316,000 | 323,800 | 2,230 | |
| 278 | Alpha | 1 | 2 | 5—1½" trap.... | 3 | 152 | 0 | 152.0 | 11.91 | 12.03 | 12.06 | 145.08 | 391,100 | 391,100 | 2,696 | |
| 279 | Portland | | | | 3 | 153 | 0 | 153.0 | 12.00 | 11.99 | 12.01 | 144.00 | 388,000 | 388,000 | 2,694 | |
| 280 | | | | | 3 | 151 | 8 | 150.9 | 12.01 | 12.02 | 12.02 | 144.48 | 329,000 | 339,200 | 2,348 | |
| 281 | | | | | 3 | 149 | 8 | 149.7 | 11.88 | 12.02 | 12.06 | 145.20 | 330,000 | 346,400 | 2,386 | |
| 282 | | | | | 3 | 149 | 0 | 149.7 | 11.86 | 12.03 | 12.05 | 144.96 | 325,000 | 343,100 | 2,367 | |
| 283 | | | | | 3 | 149 | 8 | 150.0 | 11.92 | 12.02 | 12.02 | 144.48 | 313,000 | 321,000 | 2,222 | |
| 284 | Alpha | 1 | 2 | 6—1½" trap.... | 3 | 141 | 8 | ..... | 11.98 | 12.04 | 12.03 | 144.84 | 218,000 | 221,500 | 1,516 | Voids. |
| 285 | Portland | | | | 3 | 151 | 8 | 150.0 | 12.03 | 12.02 | 12.07 | 145.08 | 323,000 | 351,000 | 2,419 | |
| 286 | | | | | 3 | 156 | 0 | 154.3 | 12.05 | 12.06 | 12.02 | 144.96 | 318,000 | 368,000 | 2,539 | |
| 287 | | | | | 3 | 154 | 0 | 152.6 | 12.08 | 12.02 | 12.01 | 144.36 | 302,000 | 328,000 | 2,272 | |
| 288 | | | | | 3 | 150 | 0 | 151.6 | 11.84 | 12.00 | 12.03 | 144.36 | 288,000 | 317,000 | 2,196 | |
| 289 | | | | | 3 | 148 | 0 | 147.3 | 12.01 | 12.02 | 12.03 | 144.60 | 236,000 | 261,000 | 1,805 | |
| 290 | Alpha | 1 | 2 | 7—1½" trap.... | 3 | 149 | 8 | 147.9 | 12.06 | 12.04 | 12.03 | 144.84 | 287,000 | 319,000 | 2,202 | |
| 291 | Portland | | | | 3 | 149 | 0 | 147.8 | 12.07 | 12.01 | 12.02 | 144.36 | 261,000 | 295,000 | 2,043 | |
| 292 | | | | | 3 | 147 | 0 | 147.4 | 11.97 | 12.02 | 11.98 | 144.00 | 253,000 | 255,000 | 1,771 | |
| 293 | | | | | 3 | 144 | 8 | 143.2 | 12.03 | 12.03 | 12.05 | 144.96 | 189,900 | 189,900 | 1,310 | |
| 294 | | | | | 3 | 147 | 8 | 146.0 | 12.08 | 12.01 | 12.03 | 144.48 | 206,000 | 206,000 | 1,426 | |
| 295 | | | | | 3 | 149 | 0 | 148.7 | 11.99 | 12.01 | 12.02 | 144.36 | 178,232 | 221,500 | 1,534 | |
| 296 | | | | | 3 | 145 | 0 | 143.6 | 12.04 | 12.05 | 12.03 | 144.96 | 175,000 | 183,300 | 1,264 | |
| 297 | Alpha | 1 | 2 | 8—1½" trap.... | 3 | 144 | 8 | 143.4 | 12.06 | 12.01 | 12.02 | 144.36 | 254,000 | 254,000 | 1,759 | |
| 298 | Portland | | | | 3 | 144 | 0 | 141.7 | 12.07 | 12.03 | 12.04 | 145.44 | 162,000 | 191,500 | 1,317 | |
| 299 | | | | | 3 | 146 | 0 | 146.0 | 11.93 | 12.06 | 12.01 | 144.84 | 198,000 | 216,000 | 1,491 | |
| 300 | | | | | 3 | 137 | 8 | 136.8 | 12.09 | 11.95 | 12.02 | 143.64 | 129,000 | 130,300 | 907 | |
| 301 | Alpha | 1 | 2 | 8—1½" trap.... | 3 | 144 | 0 | 141.7 | 12.06 | 12.06 | 12.07 | 145.56 | 160,116 | 161,400 | 1,109 | |
| 302 | Portland | | | | 3 | 147 | 0 | 146.3 | 12.02 | 12.02 | 12.02 | 144.48 | 204,200 | 204,200 | 1,413 | |
| 303 | | | | | 3 | 143 | 8 | 142.5 | 12.00 | 12.03 | 12.05 | 144.96 | 210,000 | 213,400 | 1,472 | |
| 304 | | | | | 3 | 140 | 8 | 139.2 | 12.10 | 12.01 | 12.00 | 144.12 | 171,000 | 171,000 | 1,186 | |
| 402 | Alpha | 1 | 2 | 4—2½" trap.... | 3 | 151 | 0 | 152.1 | 11.85 | 12.04 | 12.02 | 144.72 | 281,000 | 318,384 | 2,200 | |
| 403 | Portland | | | | 3 | 149 | 0 | 148.8 | 11.93 | 12.05 | 12.04 | 145.08 | 262,000 | 282,500 | 1,947 | |
| 404 | | | | | 3 | 149 | 8 | 149.8 | 11.89 | 12.06 | 12.03 | 145.08 | 259,900 | 262,300 | 1,808 | |
| 405 | | | | | 3 | 149 | 12 | 148.1 | 12.01 | 12.03 | 12.01 | 144.48 | 216,000 | 221,800 | 1,535 | |
| 406 | | | | | 3 | 147 | 0 | 146.5 | 12.01 | 12.01 | 12.02 | 144.36 | 182,000 | 189,000 | 1,309 | |
| 407 | Steel | 1 | 2 | 4—2½" trap.... | 3 | 151 | 8 | 153.0 | 11.88 | 11.99 | 12.01 | 144.00 | 227,000 | 283,800 | 1,971 | |
| 408 | Portland | | | | 3 | 152 | 0 | 152.8 | 11.89 | 12.02 | 12.03 | 144.60 | 237,000 | 289,900 | 2,005 | |
| 409 | | | | | 3 | 151 | 0 | 151.1 | 11.88 | 12.03 | 12.03 | 145.32 | 245,000 | 275,400 | 1,895 | |
| 410 | | | | | 3 | 152 | 8 | 152.1 | 11.90 | 12.02 | 12.03 | 144.60 | 261,000 | 301,800 | 2,087 | |
| 411 | | | | | 3 | 153 | 8 | 151.6 | 12.02 | 12.03 | 12.02 | 144.60 | 231,360 | 251,000 | 1,736 | |

## Compression Tests—Continued.

| Marks. | Brand of cement. | Composition. Cement. | Sand. | Broken stone. | Age. | Weight. Total. | | Weight. Per cubic foot. | Dimensions. Height. | Dimensions. Compressed surface. | | Sectional area. | Ultimate strength. First crack. | Ultimate strength. Total. | Ultimate strength. Per square inch. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Mos.* | *Lbs.* | *Ozs.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq.inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| 427 | Norton | 1 | 2 | 4—2½" trap | 3 | 150 | 0 | 149.5 | 12.00 | 12.01 | 12.03 | 144.48 | 28,200 | 66,500 | 460 | |
| 428 | Rosendale | | | | 3 | 145 | 8 | 145.4 | 11.92 | 12.03 | 12.06 | 145.08 | 19,000 | 41,200 | 284 | |
| 429 | | | | | 3 | 147 | 0 | 145.3 | 12.06 | 12.03 | 12.05 | 144.96 | 19,500 | 38,100 | 263 | |
| 430 | | | | | 3 | 145 | 8 | 145.1 | 11.98 | 12.02 | 12.03 | 144.60 | 18,500 | 38,300 | 265 | |
| 431 | | | | | 3 | 146 | 0 | 145.9 | 11.98 | 12.01 | 12.02 | 144.36 | 28,872 | 56,200 | 389 | |
| 432 | Norton | 1 | 2 | 0 | 3 | 120 | 0 | 120.6 | 11.85 | 12.04 | 12.05 | 145.08 | 31,400 | 36,100 | 249 | |
| 433 | Rosendale | | | | 3 | 120 | 8 | 119.9 | 11.99 | 12.03 | 12.04 | 144.84 | 26,500 | 33,600 | 232 | |
| 434 | | | | | 3 | 120 | 0 | 121.0 | 11.82 | 12.05 | 12.03 | 144.96 | 31,400 | 39,400 | 272 | |
| 435 | | | | | 3 | 121 | 0 | 122.0 | 11.81 | 12.06 | 12.08 | 145.08 | 33,200 | 42,200 | 291 | |
| 436 | | | | | 3 | 119 | 0 | 120.0 | 11.81 | 12.05 | 12.04 | 145.08 | 45,300 | 49,500 | 341 | |
| 442 | Alpha | 1 | 2 | 4—1½" to 3" pebbles | 3 | 150 | 0 | 148.5 | 12.06 | 12.04 | 12.02 | 144.72 | 352,000 | 459,900 | 3,178 | |
| 443 | Portland | | | | 3 | 150 | 8 | 148.8 | 12.05 | 12.05 | 12.04 | 145.08 | 298,000 | 445,100 | 3,068 | |
| 444 | | | | | 3 | 148 | 8 | 148.1 | 11.95 | 12.04 | 12.04 | 144.96 | 393,000 | 481,000 | 3,318 | |
| 445 | | | | | 3 | 148 | 0 | 147.6 | 11.97 | 12.02 | 12.04 | 144.72 | 440,000 | 472,500 | 3,265 | |
| 446 | | | | | 3 | 147 | 8 | 145.9 | 12.07 | 12.04 | 12.02 | 144.72 | 440,000 | 463,104 | 3,200 | |
| 452 | Alpha | 1 | 2 | 4—1½" to 2½" broken brick | 3 | 129 | 8 | 130.9 | 11.81 | 12.05 | 12.01 | 144.72 | 334,000 | 417,000 | 2,881 | |
| 453 | Portland | | | | 3 | 131 | 8 | 131.2 | 11.98 | 12.03 | 12.02 | 144.60 | 379,000 | 399,900 | 2,766 | |
| 454 | | | | | 3 | 131 | 0 | 131.3 | 11.95 | 12.02 | 12.00 | 144.24 | 378,000 | 399,800 | 2,772 | |
| 455 | | | | | 3 | 131 | 0 | 130.8 | 11.94 | 12.03 | 12.05 | 144.96 | 382,000 | 432,000 | 2,980 | |
| 456 | | | | | 3 | 130 | 8 | 130.3 | 11.98 | 12.05 | 12.04 | 145.08 | 319,176 | 360,500 | 2,485 | |
| 462 | Alpha | 1 | 3 | 6—1½" to 2½" broken brick | 3 | 131 | 4 | 130.5 | 11.98 | 12.05 | 12.04 | 145.08 | 242,000 | 288,000 | 1,985 | |
| 463 | Portland | | | | 3 | 131 | 0 | 129.8 | 11.99 | 12.07 | 12.02 | 145.08 | 284,000 | 309,000 | 2,130 | |
| 464 | | | | | 3 | 129 | 8 | 129.5 | 11.90 | 12.05 | 12.05 | 145.20 | 305,000 | 332,400 | 2,289 | |
| 465 | | | | | 3 | 131 | 0 | 131.7 | 11.86 | 12.04 | 12.04 | 144.96 | 317,000 | 350,200 | 2,416 | |
| 466 | | | | | 3 | 129 | 8 | 128.9 | 11.95 | 12.05 | 12.06 | 145.32 | 321,000 | 348,768 | 2,400 | |
| 467 | | | | | 3 | 130 | 0 | 130.0 | 11.93 | 12.02 | 12.05 | 144.84 | 235,000 | 295,400 | 2,039 | |
| 468 | | | | | 3 | 132 | 0 | 133.1 | 11.87 | 12.01 | 12.02 | 144.36 | 253,000 | 316,000 | 2,189 | |
| 480 | Alpha | 1 | a1 | 0 | 3 | 134 | 0 | 136.1 | 11.73 | 12.04 | 12.05 | 145.08 | 310,000 | b 810,000 | 5,583 | |
| 481 | Portland | | | | 3 | 136 | 8 | 136.7 | 11.90 | 12.02 | 12.06 | 144.96 | 690,000 | 739,000 | 5,098 | |
| 482 | | | | | 3 | 135 | 0 | 135.8 | 11.82 | 12.05 | 12.06 | 145.32 | 576,000 | 810,000 | 5,574 | |
| 488 | | | | | 3 | 137 | 0 | 136.9 | 11.90 | 12.05 | 12.06 | 145.32 | 755,664 | 810,000 | 5,574 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 484 | Alpha | 1 | a 2 | 0 | 3 | 135 | 0 | 133.9 | 12.00 | 12.05 | 12.05 | 145.20 | 564,500 | 564,500 | 3,888 |
| 485 | Portland | | | | 3 | 135 | 0 | 134.1 | 11.94 | 12.08 | 12.06 | 145.68 | 650,500 | 650,500 | 4,465 |
| 486 | | | | | 3 | 134 | 8 | 133.9 | 11.96 | 12.03 | 12.06 | 145.08 | 616,000 | 616,000 | 4,246 |
| 487 | Alpha | 1 | a 3 | 0 | 3 | 128 | 4 | 129.3 | 11.82 | 12.04 | 12.04 | 144.96 | 386,000 | 386,000 | 2,663 |
| 488 | Portland | | | | 3 | 127 | 8 | 127.5 | 11.90 | 12.03 | 12.07 | 145.20 | 354,000 | 358,500 | 2,469 |
| 489 | | | | | 3 | 128 | 8 | 127.6 | 11.98 | 12.06 | 12.04 | 145.20 | 365,000 | 365,000 | 2,514 |
| 490 | | | | | 3 | 126 | 0 | 125.0 | 12.02 | 12.06 | 12.02 | 144.96 | 312,800 | 312,800 | 2,158 |
| 491 | Alpha | 1 | a 2 | 4—2½″ trap | 3 | 152 | 0 | 152.4 | 11.89 | 12.05 | 12.03 | 144.96 | 316,000 | 420,200 | 2,899 |
| 492 | Portland | | | | 3 | 152 | 0 | 150.5 | 11.99 | 12.05 | 12.08 | 145.56 | 429,000 | 499,600 | 3,432 |
| 493 | | | | | 3 | 156 | 0 | 154.5 | 12.10 | 12.00 | 12.02 | 144.24 | 453,000 | 472,600 | 3,276 |
| 494 | | | | | 3 | 156 | 0 | 154.2 | 12.02 | 12.06 | 12.06 | 145.44 | 292,000 | 401,400 | 2,760 |
| 495 | | | | | 3 | 153 | 0 | 154.0 | 11.79 | 12.05 | 12.08 | 145.56 | 308,000 | 378,500 | 2,600 |

a Granite dust.

b Load of 810,000 pounds applied and released ten times without rupture of the cube. The cube was then subjected to a concentrated load on one face over a section 8″.25 ×8.00=66 square inches. Ultimate strength, 499,500 pounds=7,568 pounds per square inch on reduced section, and 8,443 pounds per square inch on full section of cube.

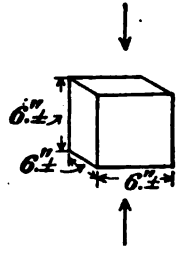
## MEAN COMPRESSIVE STRENGTH OF CONCRETE AND MORTAR CUBES.

12-INCH CUBES.

| Brand of cement. | Age. | Composition. | | | Mean strength per square inch. |
|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | |
| | *Mos.* | | | | *Pounds.* |
| Alpha Portland | 3 | 1 | 2 | 2—¼" trap | 2,200 |
| ..... | ..... | 1 | 2 | 3—¼" trap | 2,149 |
| ..... | ..... | 1 | 2 | 5—¼" trap | 2,089 |
| ..... | ..... | 1 | 2 | 6—¼" trap | 1,651 |
| ..... | ..... | 1 | 2 | 7—¼" trap | 1,305 |
| ..... | ..... | 1 | 2 | 8—¼" trap | 1,028 |
| ..... | ..... | 1 | 2 | 9—¼" trap | 816 |
| Alpha Portland | 3 | 1 | 2 | 2—1½" trap | 1,768 |
| ..... | ..... | 1 | 2 | 3—1½" trap | 1,911 |
| ..... | ..... | 1 | 2 | 4—1½" trap | 2,155 |
| ..... | ..... | 1 | 2 | 5—1½" trap | 2,452 |
| ..... | ..... | 1 | 2 | 6—1½" trap | 2,124 |
| ..... | ..... | 1 | 2 | 7—1½" trap | 1,650 |
| ..... | ..... | 1 | 2 | 8—1½" trap | 1,332 |
| Alpha Portland | 3 | 1 | 2 | 4—2½" trap | 1,760 |
| Alpha Portland | 3 | 1 | 2 | 4—1½" to ⅜" pebbles | 3,206 |
| Alpha Portland | 3 | 1 | 2 | 4—1½" to 2½" broken brick | 2,777 |
| Alpha Portland | 3 | 1 | 3 | 6—1½" to 2½" broken brick | 2,207 |
| Alpha Portland | 3 | 1 | a1 | 0 | 5,457 |
| | 3 | 1 | a2 | 0 | 4,199 |
| | 3 | 1 | a3 | 0 | 2,451 |
| Alpha Portland | 3 | 1 | a2 | 4—2½" trap | 2,998 |
| Steel Portland | 3 | 1 | 2 | 4—2½" trap | 1,989 |
| Norton's Rosendale | 3 | 1 | 2 | 0 | 277 |
| | 3 | 1 | 2 | 4—2½" trap | 332 |
| Alpha Portland | 4 | 1 | 1 | 0 | 4,371 |
| | 4 | 1 | 2 | 0 | 2,506 |
| | 4 | 1 | 3 | 0 | 1,812 |
| | 4 | 1 | 4 | 0 | 829 |
| | 4 | 1 | 5 | 0 | 484 |
| | 4 | 1 | 6 | 0 | 185 |
| | 4 | 1 | 7 | 0 | 118 |
| Atlas Portland | 4 | 1 | 1 | 0 | 5,570 |
| Star Portland | 4 | 1 | 1 | 0 | 5,045 |
| Steel Portland | 4 | 1 | 1 | 0 | 1,743 |
| Saylor's Portland | 4 | 1 | 1 | 0 | 3,979 |
| Germania Portland | 4 | 1 | 1 | 0 | 4,353 |
| Hoffman's Rosendale | 4 | 1 | 1 | 0 | 741 |
| Norton's Rosendale | 4 | 1 | 1 | 0 | 643 |
| Alpha Portland | 4 | 1 | a1 | | 5,306 |
| Alpha Portland | 4 | 1 | 2 | 2—{2½" trap, ¼" trap} | 2,884 |
| | 4 | 1 | 2 | 3—{2½" trap} | 2,809 |
| | 4 | 1 | 2 | 4—{2½" trap} | 2,250 |
| | 4 | 1 | 2 | 5—{¼" trap} | 2,441 |
| | 4 | 1 | 2 | 6— | 2,411 |
| Alpha Portland | 4 | 1 | 2 | 4—2½" trap | 2,178 |
| ..... | ..... | 1 | 3 | 6—2½" trap | 1,672 |
| ..... | ..... | 1 | 4 | 8—2½" trap | 1,185 |
| ..... | ..... | 1 | 5 | 10—2½" trap | 796 |
| ..... | ..... | 1 | 6 | 12—2½" trap | 738 |
| Alpha Portland | 4 | 1 | 2 | 4—¼" trap | 2,294 |
| ..... | ..... | 1 | 3 | 6—¼" trap | 1,626 |
| ..... | ..... | 1 | 4 | 8—¼" trap | 1,025 |
| ..... | ..... | 1 | 5 | 10—¼" trap | 620 |
| ..... | ..... | 1 | 6 | 12—¼" trap | 513 |
| Alsen's Portland | 4 | 1 | 1 | 8—¼" trap | 3,079 |

a Granite dust.

## EXPERIMENTS ON RETARDED SET OF CEMENT MORTAR.




FIRST SERIES.

| Marks. | Brand of cement. | Composition. | | | Age. | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | | *Days.* | *Lbs.* | *Oz.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | |
| 10 | Alpha | 1 | 2 | 0 | 70 | 16 | 14½ | 130.0 | 6.16 | 6.02 | 6.06 | 36.48 | 67,900 | 67,900 | 1,861 | Time from mixing and filling the first mold (cube 10) until the last mold was filled (cube 27) one hour. |
| 11 | Portland | | | | | 16 | 10 | 128.7 | 6.15 | 6.02 | 6.03 | 36.30 | 57,300 | 57,300 | 1,578 | |
| 12 | | | | | | 16 | 9½ | 129.9 | 6.08 | 6.00 | 6.05 | 36.30 | 54,900 | 54,900 | 1,512 | |
| 13 | | | | | | 16 | 11 | 131.5 | 6.08 | 6.00 | 6.01 | 36.06 | 67,400 | 67,400 | 1.869 | |
| 14 | | | | | | 16 | 9½ | 129.0 | 6.12 | 6.06 | 5.99 | 36.30 | 57,600 | 57,600 | 1,587 | |
| 15 | | | | | | 16 | 10½ | 129.4 | 6.15 | 6.05 | 5.98 | 36.18 | 55,380 | 55,380 | 1,531 | |
| 16 | | | | | | 16 | 6 | 127.2 | 6.13 | 6.05 | 6.00 | 36.30 | 54,700 | 54,700 | 1,507 | |
| 17 | | | | | | 16 | 7 | 128.3 | 6.06 | 6.08 | 6.01 | 36.54 | 59,600 | 59,600 | 1,631 | |
| 18 | | | | | | 16 | 4 | 127.6 | 6.07 | 6.04 | 6.00 | 36.24 | 56,050 | 56,050 | 1,547 | |
| 19 | | | | | | 16 | 8 | 129.0 | 6.12 | 6.00 | 6.02 | 36.12 | 58,480 | 58,480 | 1,619 | |
| 20 | | | | | | 16 | 15 | 129.4 | 6.15 | 6.06 | 6.07 | 36.78 | 62,300 | 62,300 | 1,694 | |
| 21 | | | | | | 16 | 12 | 127.3 | 6.19 | 6.06 | 6.06 | 36.72 | 54,400 | 54,400 | 1,481 | |
| 22 | | | | | | 16 | 8 | 128.1 | 6.07 | 6.07 | 6.04 | 36.66 | 58,700 | 58,700 | 1,601 | |
| 23 | | | | | | 16 | 7 | 128.3 | 6.08 | 6.05 | 6.02 | 36.42 | 50,200 | 50,200 | 1,378 | |
| 24 | | | | | | 16 | 6 | 128.4 | 6.07 | 6.04 | 6.01 | 36.30 | 53,800 | 53,800 | 1,482 | |
| 25 | | | | | | 16 | 7½ | 128.7 | 6.07 | 6.05 | 6.02 | 36.42 | 56,500 | 56,500 | 1,551 | |
| 26 | | | | | | 16 | 7½ | 127.0 | 6.10 | 6.04 | 6.08 | 36.72 | 49,900 | 49,900 | 1,359 | |
| 27 | | | | | | 16 | 8½ | 128.8 | 6.05 | 6.06 | 6.05 | 36.66 | 49,400 | 49,400 | 1,347 | |

## EXPERIMENTS ON RETARDED SET OF CEMENT MORTAR—Continued.

SECOND SERIES.

[Molds 28, 29, and 30 were filled immediately after mixing the mortar.]

| Marks. | Brand of cement. | Composition. | | | Age. | Weight. | | | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | Total. | | Per cubic foot. | Height. | Compressed surface. | | | | Total. | Per square inch. | |
| | | | | | *Days.* | *Lbs.* | *Oz.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* | Molds filled at— |
| 28 | Alpha | 1 | 2 | 0 | 62 | 16 | 7½ | 131.7 | 6.00 | 6.05 | 5.95 | 36.00 | 94,800 | 94,800 | 2,633 | |
| 29 | Portland | | | | | 16 | 11 | 131.1 | 6.04 | 6.00 | 6.07 | 36.42 | 96,200 | 96,200 | 2,641 | 9.30 a. m. |
| 30 | | | | | | 16 | 9½ | 131.6 | 6.01 | 6.04 | 6.00 | 36.24 | 107,800 | 107,800 | 2,975 | |
| 31 | | | | | | 16 | 11 | 132.2 | 6.02 | 5.99 | 6.05 | 36.24 | 103,700 | 103,700 | 2,861 | |
| 32 | | | | | | 16 | 12½ | 132.2 | 6.04 | 6.05 | 6.00 | 36.30 | 94,000 | 95,100 | 2,620 | 10.30 a. m. |
| 33 | | | | | | 16 | 10½ | 131.5 | 6.04 | 6.05 | 5.99 | 36.24 | 100,200 | 100,200 | 2,765 | |
| 34 | | | | | | 16 | 13½ | 132.7 | 6.05 | 6.04 | 6.00 | 36.24 | 93,100 | 93,500 | 2,580 | |
| 35 | | | | | | 17 | 0 | 133.1 | 6.10 | 6.00 | 6.03 | 36.18 | 97,900 | 98,300 | 2,717 | 11.30 a. m. |
| 36 | | | | | | 17 | ½ | 132.4 | 6.11 | 6.00 | 6.06 | 36.36 | 97,600 | 97,600 | 2,684 | |
| 37 | | | | | | 17 | ½ | 132.4 | 6.13 | 6.00 | 6.04 | 36.24 | 90,400 | 90,400 | 2,494 | |
| 38 | | | | | | 17 | 1½ | 132.8 | 6.13 | 6.00 | 6.05 | 36.30 | 96,100 | 96,100 | 2,647 | 12.30 p. m. |
| 39 | | | | | | 17 | 1½ | 132.3 | 6.15 | 6.05 | 6.00 | 36.30 | 93,100 | 93,100 | 2,565 | |
| 40 | | | | | | 17 | ½ | 133.3 | 6.09 | 6.00 | 6.04 | 36.24 | 85,200 | 85,200 | 2,351 | |
| 41 | | | | | | 16 | 8½ | 129.8 | 6.07 | 6.04 | 6.00 | 36.24 | 86,600 | 86,600 | 2,390 | 1.30 p. m. |
| 42 | | | | | | 16 | 15 | 133.9 | 6.07 | 6.00 | 6.00 | 36.00 | 92,100 | 92,100 | 2,558 | |
| 43 | | | | | | 16 | 12 | 131.4 | 6.10 | 6.00 | 6.02 | 36.12 | 81,400 | 81,400 | 2,253 | |
| 44 | | | | | | 16 | 12 | 130.7 | 6.06 | 6.07 | 6.02 | 36.54 | 81,700 | 81,700 | 2,236 | 2.30 p. m. |
| 45 | | | | | | 16 | 10½ | 130.7 | 6.04 | 6.06 | 6.02 | 36.48 | 87,000 | 87,000 | 2,385 | |
| 46 | | | | | | 16 | 7½ | 128.7 | 6.07 | 6.06 | 6.01 | 36.42 | 90,800 | 90,800 | 2,469 | |
| 47 | | | | | | 16 | 9½ | 129.7 | 6.06 | 6.07 | 6.01 | 36.48 | 81,700 | 81,700 | 2,240 | |
| 48 | | | | | | 16 | 10 | 130.8 | 6.07 | 6.08 | 6.00 | 36.18 | 77,300 | 77,300 | 2,136 | 2.45 p. m. |
| 49 | | | | | | 17 | 1 | 133.3 | 6.06 | 6.00 | 6.08 | 36.48 | 84,900 | 84,900 | 2,327 | |
| 50 | | | | | | 16 | 7 | 130.0 | 6.01 | 6.06 | 6.00 | 36.36 | 75,400 | 75,400 | 2,074 | |
| 51 | | | | | | 16 | 10½ | 130.0 | 6.01 | 6.05 | 5.99 | 36.24 | 80,600 | 80,600 | 2,224 | |

From the time of mixing until put into the molds the mortar was occasionally stirred and some water added to keep the mortar at a uniform consistenccy.

Size of specimens, 12-inch cubes.
Gauged length, 5″.

| Marks. | Brand of cement. | Composition. | | | Age. | Modulus of elasticity between loads per square inch of— | | | Permanent sets after loads per square inch of— | | | Compressive strength per square inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | 100 and 600. | 100 and 1,000. | 1,000 and 2,000. | 600. | 1,000. | 2,000. | |
| | | | | | *Mos.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Pounds.* |
| 2 | Alpha Portland | 1 | 1 | 0 | 4 | 3,571,000 | 3,750,000 | 3,125,000 | .0001 | .0002 | .0001 | 3,839 |
| 10 | do | 1 | 2 | 0 | 4 | 3,125,000 | 2,647,000 | 2,381,000 | 0. | .0001 | 0. | 2,411 |
| 12 | do | 1 | 3 | 0 | 4 | 1,786,000 | 1,452,000 | | .0003 | .0009 | | 1,783 |
| 19 | do | 1 | 5 | 0 | 4 | | | | | | | 566 |
| 30 | do | 1 | 6 | 0 | 4 | | | | | | | 228 |
| 35 | do | 1 | 7 | 0 | 4 | | | | | | | 147 |
| 39 | Atlas Portland | 1 | 1 | 0 | 4 | 6,250,000 | 4,500,000 | 3,846,000 | 0. | 0. | .0001 | 5,572 |
| 43 | Star Portland | 1 | 1 | 0 | 4 | 4,167,000 | 3,750,000 | 3,333,000 | 0. | 0. | .0001 | 5,471 |
| 52 | Steel Portland | 1 | 1 | 0 | 4 | 1,190,000 | 1,098,000 | | .0009 | .0028 | | 1,800 |
| 57 | Saylor's Portland | 1 | 1 | 0 | 4 | 3,125,000 | 3,000,000 | 2,500,000 | .0001 | .0002 | .0005 | 3,945 |
| 62 | Germania Portland | 1 | 1 | 0 | 4 | 2,500,000 | 2,647,000 | 2,500,000 | 0. | .0002 | .0006 | 4,146 |
| 67 | Hoffman's Rosendale | 1 | 1 | 0 | 4 | | | | | | | 624 |
| 72 | Norton's Rosendale | 1 | 1 | 0 | 4 | | | | | | | 568 |
| 76 | Alpha Portland | 1 | a1 | 0 | 4 | 3,571,000 | 3,750,000 | 2,381,000 | .0001 | .0001 | .0002 | 5,190 |
| 88 | Alsen's Portland | 1 | 1 | 3— ½″ trap | 4 | 2,500,000 | 2,812,000 | 1,562,000 | .0001 | .0006 | .0028 | 3,040 |
| 94 | Alpha Portland | 1 | 2 | 2—2½″ and ½″ trap | 4 | 3,125,000 | 2,812,000 | 1,562,000 | .0003 | .0006 | .0028 | 2,600 |
| 96 | do | 1 | 2 | 3—2½″ and ½″ trap | 4 | 3,125,000 | 2,812,000 | 1,250,000 | .0002 | .0004 | .0038 | 2,400 |
| 102 | do | 1 | 2 | 4—2½″ and ½″ trap | 4 | 2,500,000 | 2,250,000 | | .0004 | .0009 | | 2,241 |
| 106 | do | 1 | 2 | 5—2½″ and ½″ trap | 4 | 3,571,000 | 2,500,000 | 1,136,000 | .0001 | .0003 | .0046 | 2,542 |
| 117 | do | 1 | 2 | 6—2½″ and ½″ trap | 4 | 3,125,000 | 3,000,000 | 1,316,000 | .0001 | .0003 | .0052 | 2,314 |
| 121 | do | 1 | 2 | 4—2½″ trap | 4 | 2,778,000 | 1,389,000 | 1,250,000 | .0003 | .0009 | .0081 | 2,334 |
| 127 | do | 1 | 3 | 6—2½″ trap | 4 | 3,125,000 | 2,368,000 | | .0001 | .0006 | | 1,932 |
| 131 | do | 1 | 4 | 8—2½″ trap | 4 | 1,562,000 | | | .0022 | | | 1,139 |
| 140 | do | 1 | 5 | 10—2½″ trap | 4 | 862,000 | | | | | | 866 |
| 144 | do | 1 | 6 | 12—2½″ trap | 4 | 1,190,000 | | | .0052 | | | 801 |
| 153 | do | 1 | 2 | 4— ½″ trap | 4 | 2,778,000 | 2,647,000 | 1,429,000 | .0001 | .0003 | .0017 | 2,600 |
| 167 | do | 1 | 3 | 6— ½″ trap | 4 | 2,273,000 | 1,800,000 | | .0002 | .0009 | | 1,502 |
| 180 | do | 1 | 4 | 8— ½″ trap | 4 | 2,083,000 | | | .0001 | | | 948 |
| 191 | do | 1 | 5 | 10— ½″ trap | 4 | 862,000 | | | .0097 | | | 745 |
| 205 | do | 1 | 6 | 12— ½″ trap | 4 | 1,667,000 | | | .0010 | | | 889 |
| 217 | do | 1 | 2 | 2— ½″ trap | 8 | 2,778,000 | 2,647,000 | 1,613,000 | 0. | .0002 | .0017 | 2,364 |
| 222 | do | 1 | 2 | 3— ½″ trap | 8 | 3,125,000 | 2,647,000 | 909,000 | .0001 | .0003 | .0119 | 2,152 |

a Granite dust.

## THE ELASTIC PROPERTIES OF CONCRETE AND MORTAR—Continued.

| Marks. | Brand of cement. | Composition. | | | Age. | Modulus of elasticity between loads per square inch of— | | | Permanent sets after loads per square inch of— | | | Compressive strength per square inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cement. | Sand. | Broken stone. | | 100 and 600. | 100 and 1,000. | 1,000 and 2,000. | 600. | 1,000. | 2,000. | |
| | | | | | *Mos.* | *Pounds.* | *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | *Inch.* | *Pounds.* |
| 228 | .....do | 1 | 2 | 5—¼" trap | 3 | 2,273,000 | 2,045,000 | ..... | .0001 | .0008 | ..... | 1,828 |
| 235 | .....do | 1 | 2 | 6—¼" trap | 3 | 2,083,000 | 1,667,000 | ..... | .0002 | .0010 | ..... | 1,853 |
| 243 | .....do | 1 | 2 | 7—¼" trap | 3 | 1,389,000 | ..... | ..... | .0018 | ..... | ..... | 983 |
| 252 | .....do | 1 | 2 | 8—¼" trap | 3 | 1,316,000 | ..... | ..... | .0011 | ..... | ..... | 900 |
| 263 | .....do | 1 | 2 | 9—¼" trap | 3 | 862,000 | ..... | ..... | .0042 | ..... | ..... | 799 |
| 264 | .....do | 1 | 2 | 2—1¼" trap | 3 | 2,778,000 | 2,812,000 | ..... | .0001 | .0004 | ..... | 1,823 |
| 272 | .....do | 1 | 2 | 3—1¼" trap | 3 | 2,778,000 | 2,500,000 | ..... | .0003 | .0012 | ..... | 2,009 |
| 274 | .....do | 1 | 2 | 4—1¼" trap | 3 | 2,778,000 | 2,368,000 | ..... | .0004 | .0010 | ..... | 2,199 |
| 278 | .....do | 1 | 2 | 5—1¼" trap | 3 | 2,273,000 | 2,368,000 | 1,250,000 | .0002 | .0007 | .0052 | 2,696 |
| 286 | .....do | 1 | 2 | 6—1¼" trap | 3 | 2,273,000 | 1,800,000 | 1,429,000 | .0007 | .0017 | .0096 | 2,539 |
| 295 | .....do | 1 | 2 | 7—1¼" trap | 3 | 1,389,000 | 1,023,000 | ..... | ..... | .0018 | .0089 | 1,534 |
| 301 | .....do | 1 | 2 | 8—1¼" trap | 3 | 1,562,000 | 978,000 | ..... | .0018 | .0094 | ..... | 1,109 |
| 402 | .....do | 1 | 2 | 4—2¼" trap | 3 | 2,778,000 | 2,250,000 | ..... | .0005 | .0016 | ..... | 2,200 |
| 411 | Steel Portland | 1 | 2 | 4—2¼" trap | 3 | 2,500,000 | 2,500,000 | ..... | .0005 | .0030 | ..... | 1,736 |
| 431 | Norton's Rosendale | 1 | 2 | 4—2¼" trap | 3 | ..... | ..... | ..... | ..... | ..... | ..... | 389 |
| 435 | .....do | 1 | 2 | 0 | 3 | ..... | ..... | ..... | ..... | ..... | ..... | 291 |
| 446 | Alpha Portland | 1 | 2 | 4—1¼" to 3" pebbles | 3 | 3,125,000 | 3,461,000 | 3,333,000 | .0001 | .0003 | .0007 | 3,200 |
| 456 | .....do | 1 | 2 | 4—1¼" to 2¼" broken brick. | 3 | 2,500,000 | 2,368,000 | 1,020,000 | .0002 | .0005 | .0033 | 2,485 |
| 466 | .....do | 1 | 3 | 6—1¼" to 2¼" broken brick. | 3 | 2,273,000 | 2,143,000 | 1,250,000 | 0. | .0003 | .0038 | 2,400 |
| 483 | .....do | 1 | a1 | 0 | 3 | 3,571,000 | 3,750,000 | 5,000,000 | .0001 | 0. | .0002 | 5,574 |
| 485 | .....do | 1 | a2 | 0 | 3 | 3,571,000 | 4,091,000 | 3,846,000 | .0001 | .0001 | .0008 | 4,465 |
| 489 | .....do | 1 | a3 | 0 | 3 | 2,778,000 | 2,500,000 | 1,562,000 | .0002 | .0002 | .0015 | 2,514 |
| 494 | .....do | 1 | a2 | 4—2¼" trap | 3 | 2,500,000 | 2,045,000 | 1,351,000 | .0003 | .0011 | .0087 | 2,760 |

a Granite dust.

Marks, 2.
Composition: Alpha Portland cement, 1; sand, 1.
Water used in mortar, 23.20 per cent of cement.
Age, 4 months.
Weight per cubic foot, 135.8 pounds.
Sectional area, 145.32 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,532 | 100 | 0. | 0. | Initial load. |
| 29,064 | 200 | .0001 | 0. | |
| 43,596 | 300 | .0003 | 0. | |
| 58,128 | 400 | .0005 | .0001 | |
| 87,192 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 116,256 | 800 | .0011 | .0001 | |
| 145,320 | 1,000 | .0014 | .0002 | E=3,750,000 pounds per square inch. |
| 174,384 | 1,200 | .0018 | .0002 | |
| 203,448 | 1,400 | .0021 | .0002 | |
| 232,512 | 1,600 | .0025 | .0002 | E=3,125,000 pounds per square inch. |
| 261,576 | 1,800 | .0027 | .0001 | |
| 290,640 | 2,000 | .0029 | .0001 | |
| 319,704 | 2,200 | .0031 | .0001 | |
| 348,768 | 2,400 | .0033 | .0001 | |
| 377,832 | 2,600 | .0035 | .0001 | |
| 406,896 | 2,800 | .0036 | .0001 | |
| 435,960 | 3,000 | .0038 | .0001 | |
| 465,024 | 3,200 | .0040 | 0. | |
| 494,088 | 3,400 | .0043 | —.0001 | |
| 523,152 | 3,600 | .0046 | —.0005 | |
| 552,216 | 3,800 | .0050 | —.0012 | |
| 558,000 | 3,839 | ..... | ..... | Ultimate strength. |

Marks, 10.
Composition: Alpha Portland cement, 1; sand, 2.
Water used in mortar, 27.64 per cent of cement.
Age, 4 months.
Weight per cubic foot, 134.1 pounds.
Sectional area, 145.56 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,556 | 100 | 0. | 0. | Initial load. |
| 29,112 | 200 | .0001 | 0. | |
| 43,668 | 300 | .0003 | 0. | |
| 58,224 | 400 | .0005 | 0. | |
| 72,780 | 500 | .0006 | 0. | |
| 87,336 | 600 | .0008 | 0. | E=3,125,000 pounds per square inch. |
| 101,892 | 700 | .0010 | 0. | |
| 116,448 | 800 | .0012 | 0. | |
| 131,004 | 900 | .0015 | 0. | |
| 145,560 | 1,000 | .0018 | .0001 | E=2,647,000 pounds per square inch. |
| 174,672 | 1,200 | .0023 | .0001 | |
| 203,784 | 1,400 | .0028 | .0001 | |
| 232,896 | 1,600 | .0032 | .0001 | E=2,881,000 pounds per square inch. |
| 262,008 | 1,800 | .0035 | .0001 | |
| 291,120 | 2,000 | .0038 | 0. | |
| 320,232 | 2,200 | .0040 | — .0002 | |
| 349,344 | 2,400 | .0050 | — .0013 | |
| 351,000 | 2,411 | ..... | ..... | Ultimate strength. |

Marks, 12.
Composition: Alpha Portland cement, 1; sand, 3.
Water used in mortar, 37.07 per cent of cement.
Age, 4 months.
Weight per cubic foot, 133.9 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 28,992 | 200 | .0002 | 0. | |
| 43,488 | 300 | .0006 | 0. | |
| 57,984 | 400 | .0010 | .0001 | |
| 72,480 | 500 | .0013 | .0002 | |
| 86,976 | 600 | .0017 | .0003 | E=1,786,000 pounds per square inch. |
| 101,472 | 700 | .0022 | .0005 | |
| 115,968 | 800 | .0027 | .0006 | |
| 130,464 | 900 | .0033 | .0007 | |
| 144,960 | 1,000 | .0040 | .0009 | E=1,452,000 pounds per square inch. |
| 173,952 | 1,200 | .0055 | .0013 | |
| 202,944 | 1,400 | .0081 | .0021 | |
| 231,936 | 1,600 | .0117 | .0088 | |
| 258,500 | 1,783 | ..... | ..... | Ultimate strength. |

Marks, 19.
Composition: Alpha Portland cement, 1; sand, 5.
Water used in mortar, 64.81 per cent of cement.
Age, 4 months.
Weight per cubic foot, 118.6 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 28,992 | 200 | .0008 | .0003 | |
| 43,488 | 300 | .0017 | .0006 | |
| 57,984 | 400 | .0030 | .0011 | |
| 72,480 | 500 | .0063 | .0033 | |
| 82,100 | 566 | ..... | ..... | Ultimate strength. |

Marks, 30.
Composition: Alpha Portland cement, 1; sand, 6.
Water used in mortar, 60.78 per cent of cement.
Age, 4 months.
Weight per cubic foot, 118 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 21,744 | 150 | .0006 | .0004 | |
| 28,992 | 200 | .0022 | .0011 | |
| 33,100 | 228 | .0040 | ..... | Ultimate strength. |

Marks, 35.
Composition: Alpha Portland cement, 1; sand, 7.
Water used in mortar, 66.84 per cent of cement.
Age, 4 months.
Weight per cubic foot, 111.6 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 7,230 | 50 | —.0007 | ..... | |
| 14,460 | 100 | 0. | ..... | |
| 21,200 | 147 | .0120 | ..... | Ultimate strength. |

Marks, 39.
Composition: Atlas Portland cement, 1; sand, 1.
Water used in mortar, 28.57 per cent of cement.
Age, 4 months.
Weight per cubic foot, 142.0 pounds.
Sectional area, 145.20 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,520 | 100 | 0. | 0. | Initial load. |
| 29,040 | 200 | 0. | 0. | |
| 58,080 | 400 | .0001 | 0. | |
| 87,120 | 600 | .0004 | 0. | E=6,250,000 pounds per square inch. |
| 116,160 | 800 | .0006 | 0. | |
| 145,200 | 1,000 | .0010 | 0. | E=4,500,000 pounds per square inch. |
| 174,240 | 1,200 | .0012 | 0. | |
| 203,280 | 1,400 | .0014 | 0. | |
| 232,320 | 1,600 | .0017 | .0001 | E=3,846,000 pounds per square inch. |
| 261,360 | 1,800 | .0021 | .0001 | |
| 290,400 | 2,000 | .0024 | .0001 | |
| 319,440 | 2,200 | .0028 | .0002 | |
| 348,480 | 2,400 | .0031 | .0003 | |
| 377,520 | 2,600 | .0034 | .0003 | |
| 406,560 | 2,800 | .0037 | .0004 | |
| 435,600 | 3,000 | .0040 | .0004 | |
| 464,640 | 3,200 | .0042 | .0005 | |
| 493,680 | 3,400 | .0045 | .0005 | |
| 522,720 | 3,600 | .0048 | .0006 | |
| 551,760 | 3,800 | .0051 | .0006 | |
| 580,800 | 4,000 | .0053 | .0007 | |
| 609,840 | 4,200 | .0057 | .0007 | |
| 638,880 | 4,400 | .0060 | .0007 | |
| 667,920 | 4,600 | .0063 | .0007 | |
| 696,960 | 4,800 | .0067 | .0008 | |
| 726,000 | 5,000 | .0069 | .0007 | |
| 755,040 | 5,200 | .0071 | .0007 | First crack. |
| 784,080 | 5,400 | .0078 | .0006 | |
| 809,000 | 5,572 | ..... | ..... | Ultimate strength. |

Marks, 43.
Composition: Star Portland cement, 1; sand, 1.
Water used in mortar, 29.42 per cent of cement.
Age, 4 months.
Weight per cubic foot, 134.5 pounds.
Sectional area, 142.56 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,256 | 100 | 0. | 0. | Initial load. |
| 28,512 | 200 | .0001 | 0. | |
| 57,024 | 400 | .0004 | 0. | |
| 85,536 | 600 | .0006 | 0. | E=4,167,000 pounds per square inch. |
| 114,048 | 800 | .0010 | 0. | |
| 142,560 | 1,000 | .0012 | 0. | E=3,750,000 pounds per square inch. |
| 171,072 | 1,200 | .0015 | .0001 | |
| 199,584 | 1,400 | .0019 | .0001 | |
| 228,096 | 1,600 | .0022 | .0001 | E=3,333,000 pounds per square inch. |
| 256,608 | 1,800 | .0025 | .0001 | |
| 285,120 | 2,000 | .0028 | .0001 | |
| 313,632 | 2,200 | .0031 | .0001 | |
| 342,144 | 2,400 | .0035 | .0001 | |
| 370,656 | 2,600 | .0039 | .0001 | |
| 399,168 | 2,800 | .0042 | .0001 | |
| 427,680 | 3,000 | .0046 | .0002 | |
| 456,192 | 3,200 | .0050 | .0003 | |
| 484,704 | 3,400 | .0055 | .0003 | |
| 513,216 | 3,600 | .0061 | .0005 | |
| 541,728 | 3,800 | .0067 | .0005 | |
| 570,240 | 4,000 | .0072 | .0006 | |
| 598,752 | 4,200 | .0080 | .0008 | |
| 627,264 | 4,400 | .0087 | .0009 | |
| 655,776 | 4,600 | .0095 | .0010 | |
| 684,288 | 4,800 | .0105 | .0012 | |
| 712,800 | 5,000 | .0114 | .0013 | |
| 741,312 | 5,200 | .0128 | .0018 | |
| 769,824 | 5,400 | .0146 | .0022 | |
| 780,000 | 5,471 | ..... | ..... | Ultimate strength. |

Marks, 52.
Composition: Steel Portland cement, 1; sand, 1.
Water used in mortar, 33.46 per cent of cement.
Age, 4 months.
Weight per cubic foot, 126.6 pounds.
Sectional area, 144.12 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per squre inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,412 | 100 | 0. | 0. | Initial load. |
| 28,824 | 200 | .0005 | 0. | |
| 43,236 | 300 | .0011 | .0002 | |
| 57,648 | 400 | .0017 | .0004 | |
| 72,060 | 500 | .0023 | .0007 | |
| 86,472 | 600 | .0030 | .0009 | E=1,190,000 pounds per square inch. |
| 100,884 | 700 | .0039 | .0013 | |
| 115,296 | 800 | .0048 | .0017 | |
| 129,708 | 900 | .0057 | .0022 | |
| 144,120 | 1,000 | .0069 | .0028 | E=1,098,000 pounds per square inch. |
| 172,944 | 1,200 | .0100 | .0048 | |
| 201,768 | 1,400 | .0144 | .0080 | |
| 230,592 | 1,600 | .0209 | .0134 | |
| 259,416 | 1,800 | .0330 | .0285 | Ultimate strength. Cube failed upon second application of this load. |

Marks, 57.
Composition: Saylor's Portland cement, 1; sand, 1.
Water used in mortar, 28.18 per cent of cement.
Age, 4 months.
Weight per cubic foot, 135.1 pounds.
Sectional area, 144.84 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0002 | 0. | |
| 57,936 | 400 | .0006 | 0. | |
| 86,904 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 115,872 | 800 | .0013 | .0001 | |
| 144,840 | 1,000 | .0017 | .0002 | E=3,000,000 pounds per square inch. |
| 173,808 | 1,200 | .0021 | .0002 | |
| 202,776 | 1,400 | .0025 | .0002 | |
| 231,744 | 1,600 | .0030 | .0003 | E=2,500,000 pounds per square inch. |
| 260,712 | 1,800 | .0034 | .0004 | |
| 289,680 | 2,000 | .0040 | .0005 | |
| 318,648 | 2,200 | .0044 | .0006 | |
| 347,616 | 2,400 | .0052 | .0006 | |
| 376,584 | 2,600 | .0058 | .0010 | |
| 405,552 | 2,800 | .0068 | .0012 | |
| 434,520 | 3,000 | .0076 | .0014 | |
| 463,488 | 3,200 | .0088 | .0019 | |
| 492,456 | 3,400 | .0101 | .0023 | |
| 521,424 | 3,600 | .0118 | .0032 | |
| 550,392 | 3,800 | .0140 | .0043 | |
| 571,400 | 3,945 | ..... | ..... | Ultimate strength. |

Marks, 62.
Composition: Germania Portland cement, 1; sand, 1.
Water used in mortar, 26.33 per cent of cement.
Age, 4 months.
Weight per cubic foot, 135.0 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 28,992 | 200 | .0002 | .0000 | |
| 43,488 | 300 | .0004 | .0000 | |
| 57,984 | 400 | .0006 | .0000 | |
| 72,480 | 500 | .0009 | 0. | |
| 86,976 | 600 | .0010 | 0. | E = 2,500,000 pounds per square inch. |
| 101,472 | 700 | .0013 | 0. | |
| 115,968 | 800 | .0014 | 0. | |
| 130,464 | 900 | .0017 | .0001 | |
| 144,960 | 1,000 | .0019 | .0002 | E = 2,647,000 pounds per square inch. |
| 173,952 | 1,200 | .0024 | .0002 | |
| 202,944 | 1,400 | .0029 | .0003 | |
| 231,936 | 1,600 | .0034 | .0004 | E = 2,500,000 pounds per square inch. |
| 260,928 | 1,800 | .0039 | .0005 | |
| 289,920 | 2,000 | .0043 | .0006 | |
| 318,912 | 2,200 | .0049 | .0008 | |
| 347,904 | 2,400 | .0055 | .0009 | |
| 376,896 | 2,600 | .0062 | .0011 | |
| 405,888 | 2,800 | .0069 | .0014 | |
| 434,880 | 3,000 | .0079 | .0018 | |
| 463,872 | 3,200 | .0087 | .0020 | |
| 492,864 | 3,400 | .0097 | .0023 | |
| 521,856 | 3,600 | .0111 | .0031 | |
| 550,848 | 3,800 | .0124 | .0037 | |
| 570,000 | ..... | ..... | ..... | First crack. |
| 579,840 | 4,000 | .0143 | .0046 | |
| 601,000 | 4,146 | .0184 | ..... | Ultimate strength. |

Marks, 67.
Composition: Hoffman's Rosendale cement, 1; sand, 1.
Water used in mortar, 34.51 per cent of cement.
Age, 4 months.
Weight per cubic foot, 127.9 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged lengths. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 28,992 | 200 | .0012 | .0008 | |
| 43,488 | 300 | .0034 | .0023 | |
| 57,984 | 400 | .0069 | .0051 | |
| 72,480 | 500 | .0085 | .0063 | First crack. |
| 86,976 | 600 | .0099 | ..... | |
| 90,500 | 624 | ..... | ..... | Ultimate strength. |

Marks, 72.
Composition: Norton's Rosendale cement, 1; sand, 1.
Water used in mortar, 37.31 per cent of cement.
Age, 4 months.
Weight per cubic foot, 124.1 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0019 | .0013 | |
| 43,380 | 300 | .0051 | .0035 | |
| 57,840 | 400 | .0112 | .0082 | |
| 62,000 | ..... | ..... | ..... | First crack. |
| 72,300 | 500 | .0082 | .0056 | |
| 82,100 | 568 | ..... | ..... | Ultimate strength. |

Marks, 76.
Composition: Alpha Portland cement, 1; granite dust, 1.
Water used in mortar, 28.19 per cent of cement.
Age, 4 months.
Weight per cubic foot, 137.4 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0002 | 0. | |
| 57,840 | 400 | .0005 | .0001 | |
| 86,760 | 600 | .0008 | .0001 | E = 3,571,000 pounds per square inch. |
| 115,680 | 800 | .0011 | .0001 | |
| 144,600 | 1,000 | .0013 | .0001 | E = 3,750,000 pounds per square inch. |
| 173,520 | 1,200 | .0016 | .0001 | |
| 202,440 | 1,400 | .0019 | .0001 | |
| 231,360 | 1,600 | .0022 | .0001 | E = 2,881,000 pounds per square inch. |
| 260,280 | 1,800 | .0024 | .0002 | |
| 289,200 | 2,000 | .0027 | .0002 | |
| 318,120 | 2,200 | .0030 | .0002 | |
| 347,040 | 2,400 | .0033 | .0002 | |
| 375,960 | 2,600 | .0035 | .0002 | |
| 404,880 | 2,800 | .0038 | .0003 | |
| 433,800 | 3,000 | .0041 | .0003 | |
| 462,720 | 3,200 | .0043 | .0004 | |
| 491,640 | 3,400 | .0046 | .0004 | |
| 520,560 | 3,600 | .0049 | .0004 | |
| 549,480 | 3,800 | .0052 | .0005 | |
| 578,400 | 4,000 | .0056 | .0005 | |
| 607,320 | 4,200 | .0060 | .0006 | |
| 636,240 | 4,400 | .0064 | .0007 | |
| 665,160 | 4,600 | .0069 | .0007 | |
| 694,080 | 4,800 | .0074 | .0008 | |
| 750,500 | 5,190 | ..... | ..... | Ultimate strength. |

Marks, 88.
Composition: Alsen's Portland cement, 1; sand, 1; ¾″ trap rock, 3.
Water used in mortar, 38.12 per cent of cement.
Age, 4 months.
Weight per cubic foot, 150.4 pounds.
Sectional area, 144.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,472 | 100 | 0. | 0. | Initial load. |
| 28,944 | 200 | .0001 | 0. | |
| 43,416 | 300 | .0003 | 0. | |
| 57,888 | 400 | .0006 | .0001 | |
| 72,360 | 500 | .0008 | .0001 | |
| 86,832 | 600 | .0011 | .0001 | E=2,500,000 pounds per square inch. |
| 101,304 | 700 | .0013 | .0002 | |
| 115,776 | 800 | .0015 | .0003 | |
| 130,248 | 900 | .0019 | .0005 | |
| 144,720 | 1,000 | .0022 | .0006 | E=2,812,000 pounds per square inch. |
| 173,664 | 1,200 | .0030 | .0008 | |
| 202,608 | 1,400 | .0038 | .0011 | |
| 231,552 | 1,600 | .0046 | .0014 | E=1,562,000 pounds per square inch. |
| 260,496 | 1,800 | .0059 | .0019 | |
| 289,440 | 2,000 | .0076 | .0028 | |
| 318,384 | 2,200 | .0101 | .0041 | |
| 347,328 | 2,400 | .0136 | .0065 | |
| 376,272 | 2,600 | .0177 | .0091 | |
| 405,216 | 2,800 | .0232 | .0131 | First crack. |
| 440,000 | 3,040 | ..... | ..... | Ultimate strength. |

Marks, 94.
Composition: Alpha Portland cement, 1; sand, 2; 2½″ and ⅝″ trap rock, 2.
Water used in mortar, 42.86 per cent of cement.
Age, 4 months.
Weight per cubic foot, 145.6 pounds.
Sectional area, 144.36 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,436 | 100 | 0. | 0. | Initial load. |
| 28,872 | 200 | .0002 | 0. | |
| 43,308 | 300 | .0004 | .0001 | |
| 57,744 | 400 | .0007 | .0001 | |
| 72,180 | 500 | .0009 | .0002 | |
| 86,616 | 600 | .0011 | .0003 | E=3,125,000 pounds per square inch. |
| 101,052 | 700 | .0013 | .0004 | |
| 115,488 | 800 | .0016 | .0004 | |
| 129,924 | 900 | .0019 | .0005 | |
| 144,360 | 1,000 | .0022 | .0006 | E=2,812,000 pounds per square inch. |
| 173,230 | 1,200 | .0028 | .0007 | |
| 202,104 | 1,400 | .0036 | .0010 | |
| 230,976 | 1,600 | .0044 | .0013 | E=1,562,000 pounds per square inch. |
| 259,848 | 1,800 | .0057 | .0018 | |
| 288,720 | 2,000 | .0076 | .0028 | |
| 317,592 | 2,200 | .0103 | .0044 | |
| 346,464 | 2,400 | .0135 | .0064 | |
| 372,000 | ..... | ..... | ..... | First crack. |
| 375,336 | 2,600 | .0175 | .0094 | Ultimate strength. |

Marks, 96.
Composition: Alpha Portland cement, 1; sand, 2; 2½" and ⅝" trap rock, 3.
Water used in mortar, 41.75 per cent of cement.
Age, 4 months.
Weight per cubic foot, 147.6 pounds.
Sectional area, 145.20 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,520 | 100 | 0. | 0. | Initial load. |
| 29,040 | 200 | .0001 | 0. | |
| 43,560 | 300 | .0004 | 0. | |
| 58,080 | 400 | .0006 | .0001 | |
| 72,600 | 500 | .0008 | .0001 | |
| 87,120 | 600 | .0010 | .0002 | E=3,125,000 pounds per square inch. |
| 101,640 | 700 | .0012 | .0002 | |
| 116,160 | 800 | .0014 | .0003 | |
| 130,680 | 900 | .0017 | .0004 | |
| 145,200 | 1,000 | .0020 | .0004 | E=2,812,000 pounds per square inch. |
| 174,240 | 1,200 | .0027 | .0006 | |
| 203,280 | 1,400 | .0036 | .0009 | |
| 232,320 | 1,600 | .0045 | .0014 | E=1,250,000 pounds per square inch. |
| 261,360 | 1,800 | .0067 | .0022 | |
| 290,400 | 2,000 | .0094 | .0038 | |
| 319,440 | 2,200 | .0140 | .0064 | |
| 348,480 | 2,400 | .0280 | .0162 | Ultimate strength. |

Marks, 102.
Composition: Alpha Portland cement, 1; sand, 2; 2½" and ⅝" trap rock, 4.
Water used in mortar, 49.13 per cent of cement.
Age, 4 months.
Weight per cubic foot, 148.4 pounds.
Sectional area, 144.84 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0003 | .0001 | |
| 43,452 | 300 | .0006 | .0001 | |
| 57,936 | 400 | .0009 | .0002 | |
| 72,420 | 500 | .0011 | .0002 | |
| 86,904 | 600 | .0014 | .0004 | E=2,500,000 pounds per square inch. |
| 101,388 | 700 | .0018 | .0005 | |
| 115,872 | 800 | .0021 | .0006 | |
| 130,356 | 900 | .0025 | .0007 | |
| 144,840 | 1,000 | .0029 | .0009 | E=2,250,000 pounds per square inch. |
| 178,808 | 1,200 | .0039 | .0013 | |
| 202,776 | 1,400 | .0048 | .0016 | |
| 231,744 | 1,600 | .0060 | .0021 | |
| 260,000 | ..... | ..... | ..... | First crack. |
| 260,712 | 1,800 | .0076 | .0029 | |
| 289,680 | 2,000 | .0094 | .0037 | |
| 318,648 | 2,200 | .0126 | .0058 | |
| 324,600 | 2,241 | ..... | ..... | Ultimate strength. |

Marks, 106.
Composition: Alpha Portland cement, 1; sand, 2; 2½" and ⅝" trap rock, 5.
Water used in mortar, 49.76 per cent of cement.
Age, 4 months.
Weight per cubic foot, 148.9 pounds.
Sectional area, 144.36 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,436 | 100 | 0. | 0. | Initial load. |
| 28,872 | 200 | .0001 | 0. | |
| 43,308 | 300 | .0002 | 0. | |
| 57,744 | 400 | .0004 | 0. | |
| 72,180 | 500 | .0006 | 0. | |
| 86,616 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 101,052 | 700 | .0011 | .0001 | |
| 115,488 | 800 | .0014 | .0001 | |
| 129,924 | 900 | .0017 | .0002 | |
| 144,360 | 1,000 | .0021 | .0003 | E=2,500,000 pounds per square inch. |
| 173,232 | 1,200 | .0030 | .0006 | |
| 202,104 | 1,400 | .0042 | .0010 | |
| 230,976 | 1,600 | .0057 | .0018 | E=1,136,000 pounds per square inch. |
| 259,848 | 1,800 | .0078 | .0028 | |
| 288,720 | 2,000 | .0108 | .0046 | |
| 317,592 | 2,200 | .0151 | .0075 | |
| 346,464 | 2,400 | .0213 | .0118 | First crack. |
| 367,000 | 2,542 | ..... | ..... | Ultimate strength. |

Marks, 117.
Composition: Alpha Portland cement, 1; sand, 2; 2½" and ⅝" trap rock, 6.
Water used in mortar, 54.72 per cent of cement.
Age, 4 months.
Weight per cubic foot, 149.7 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0002 | 0. | |
| 43,380 | 300 | .0003 | 0. | |
| 57,840 | 400 | .0005 | .0001 | |
| 72,300 | 500 | .0007 | .0001 | |
| 86,760 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 101,220 | 700 | .0010 | .0002 | |
| 115,680 | 800 | .0013 | .0002 | |
| 130,140 | 900 | .0016 | .0003 | |
| 144,600 | 1,000 | .0018 | .0003 | E=3,000,000 pounds per square inch. |
| 173,520 | 1,200 | .0026 | .0006 | |
| 202,440 | 1,400 | .0037 | .0010 | |
| 231,360 | 1,600 | .0053 | .0019 | E=1,316,000 pounds per square inch. |
| 260,280 | 1,800 | .0073 | .0032 | |
| 289,200 | 2,000 | .0105 | .0052 | |
| 144,600 | 1,000 | .0083 | ..... | Load left on cube at 5 p. m. |
| 109,200 | 755 | .0085 | ..... | Load on cube at 8 a. m., after 15 hours. |
| 14,460 | 100 | ..... | .0066 | |
| 289,200 | 2,000 | .0117 | .0069 | |
| 318,120 | 2,200 | .0143 | .0083 | |
| 334,000 | 2,310 | .0184 | ..... | First crack. |
| 334,600 | 2,314 | ..... | ..... | Ultimate strength. |

Marks, 121.
Composition: Alpha Portland cement, 1; sand, 2; 2½" trap rock, 4.
Water used in mortar, 48.89 per cent of cement.
Age, 4 months.
Weight per cubic foot, 151.9 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 28,992 | 200 | .0002 | 0. | |
| 43,488 | 300 | .0004 | .0001 | |
| 57,984 | 400 | .0007 | .0001 | |
| 72,480 | 500 | .0009 | .0002 | |
| 86,976 | 600 | .0012 | .0003 | E=2,778,000 pounds per square inch. |
| 101,472 | 700 | .0016 | .0004 | |
| 115,968 | 800 | .0019 | .0006 | |
| 130,464 | 900 | .0023 | .0007 | |
| 144,960 | 1,000 | .0027 | .0009 | E=1,389,000 pounds per square inch. |
| 173,952 | 1,200 | .0038 | .0014 | |
| 202,944 | 1,400 | .0051 | .0022 | |
| 231,936 | 1,600 | .0066 | .0031 | E=1,250,000 pounds per square inch. |
| 260,928 | 1,800 | .0092 | .0047 | |
| 289,920 | 2,000 | .0139 | .0081 | |
| 318,912 | 2,200 | .0236 | .0151 | First crack. |
| 338,300 | 2,334 | ..... | ..... | Ultimate strength. |

Marks, 127.
Composition: Alpha Portland cement, 1; sand, 3; 2½" trap rock, 6.
Water used in mortar, 66.67 per cent of cement.
Age, four months.
Weight per cubic foot, 150.6 pounds.
Sectional area, 144.84 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0001 | 0. | |
| 43,452 | 300 | .0002 | 0. | |
| 57,936 | 400 | .0004 | 0. | |
| 72,420 | 500 | .0006 | .0001 | |
| 86,904 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 101,388 | 700 | .0012 | .0001 | |
| 115,872 | 800 | .0015 | .0003 | |
| 130,356 | 900 | .0020 | .0005 | |
| 144,840 | 1,000 | .0025 | .0006 | E=2,368,000 pounds per square inch. |
| 173,808 | 1,200 | .0039 | .0012 | |
| 202,776 | 1,400 | .0057 | .0022 | |
| 231,744 | 1,600 | .0080 | .0037 | |
| 260,712 | 1,800 | .0131 | .0078 | First crack. |
| 279,900 | 1,932 | ..... | ..... | Ultimate strength. |

Marks, 131.
Composition: Alpha Portland cement, 1; sand, 4; 2½" trap rock, 8.
Water used in mortar, 87.02 per cent of cement.
Age, 4 months.
Weight per cubic foot, 144.1 pounds.
Sectional area, 144.72 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,472 | 100 | 0. | 0. | Initial load. |
| 28,944 | 200 | .0004 | .0002 | |
| 43,416 | 300 | .0010 | .0004 | |
| 57,888 | 400 | .0016 | .0008 | |
| 72,360 | 500 | .0025 | .0014 | |
| 86,832 | 600 | .0038 | .0022 | E=1,562,000 pounds per square inch. |
| 101,304 | 700 | .0053 | .0034 | |
| 115,776 | 800 | .0077 | .0052 | |
| 130,248 | 900 | .0117 | .0086 | |
| 144,720 | 1,000 | .0177 | .0137 | First crack. |
| 164,800 | 1,139 | ..... | ..... | Ultimate strength. |

Marks, 140.
Composition: Alpha Portland cement, 1; sand, 5; 2½" trap rock, 10.
Water used in mortar, 100.50 per cent of cement.
Age, 4 months.
Weight per cubic foot, 139.6 pounds.
Sectional area, 145.08 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,508 | 100 | 0. | 0. | Initial load. |
| 29,016 | 200 | .0008 | .0004 | |
| 43,524 | 300 | .0023 | .0016 | |
| 58,032 | 400 | .0051 | .0038 | |
| 72,540 | 500 | .0091 | .0071 | |
| 87,048 | 600 | .0146 | .0117 | E=862,000 pounds per square inch. |
| 101,556 | 700 | .0209 | .0171 | First crack. |
| 125,600 | 866 | ..... | ..... | Ultimate strength. |

Marks, 144.
Composition: Alpha Portland cement, 1; sand, 6; 2½″ trap rock, 12.
Water used in mortar, 124.39 per cent of cement.
Age, 4 months.
Weight per cubic foot, 142 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0006 | .0002 | |
| 43,344 | 300 | .0013 | .0007 | |
| 57,792 | 400 | .0024 | .0014 | |
| 72,240 | 500 | .0043 | .0028 | |
| 86,688 | 600 | .0073 | .0052 | E = 1,190,000 pounds per square inch. |
| 101,136 | 700 | .0113 | .0083 | |
| 112,000 | ..... | ..... | ..... | First crack. |
| 115,584 | 800 | .0131 | .0089 | |
| 115,700 | 801 | ..... | ..... | Ultimate strength. |

Marks, 153.
Composition: Alpha Portland cement, 1; sand, 2; ⅝″ trap rock, 4.
Water used in mortar, 55.31 per cent of cement.
Age, 4 months.
Weight per cubic foot, 143.1 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0002 | 0. | |
| 43,344 | 300 | .0005 | .0001 | |
| 57,792 | 400 | .0006 | .0001 | |
| 72,240 | 500 | .0009 | .0001 | |
| 86,688 | 600 | .0010 | .0001 | E = 2,778,000 pounds per square inch. |
| 101,136 | 700 | .0012 | .0001 | |
| 115,584 | 800 | .0015 | .0002 | |
| 130,032 | 900 | .0017 | .0002 | |
| 134,480 | 1,000 | .0020 | .0003 | E = 2,647,000 pounds per square inch. |
| 173,376 | 1,200 | .0027 | .0004 | |
| 202,272 | 1,400 | .0034 | .0005 | |
| 231,168 | 1,600 | .0042 | .0008 | E = 1,429,000 pounds per square inch. |
| 260,064 | 1,800 | .0052 | .0011 | |
| 288,960 | 2,000 | .0069 | .0017 | |
| 317,856 | 2,200 | .0088 | .0025 | |
| 346,752 | 2,400 | .0121 | .0042 | |
| 375,648 | 2,600 | .0175 | ..... | Ultimate strength. |

Marks, 167.
Composition: Alpha Portland cement, 1; sand, 3; ⅝″ trap rock, 6.
Water used in mortar, 71.15 per cent of cement.
Age, 4 months.
Weight per cubic foot, 140.2 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0001 | 0. | |
| 43,344 | 300 | .0005 | .0001 | |
| 57,792 | 400 | .0007 | .0001 | |
| 72,240 | 500 | .0010 | .0002 | |
| 86,688 | 600 | .0013 | .0002 | E=2,273,000 pounds per square inch. |
| 101,136 | 700 | .0017 | .0003 | |
| 115,584 | 800 | .0022 | .0005 | |
| 130,032 | 900 | .0026 | .0006 | |
| 144,480 | 1,000 | .0034 | .0009 | E=1,800,000 pounds per square inch. |
| 173,376 | 1,200 | .0053 | .0019 | |
| 202,272 | 1,400 | .0121 | .0066 | |
| 217,000 | 1,502 | .0180 | ..... | Ultimate strength. |

Marks, 180.
Composition: Alpha Portland cement, 1; sand, 4; ¾″ trap rock, 8.
Water used in mortar, 96.62 per cent of cement.
Age, 4 months.
Weight per cubic foot, 135.2 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0002 | 0. | |
| 43,344 | 300 | .0004 | 0. | |
| 57,792 | 400 | .0007 | 0. | |
| 72,240 | 500 | .0009 | 0. | |
| 86,688 | 600 | .0013 | .0001 | E=2,083,000 pounds per square inch. |
| 101,136 | 700 | .0017 | .0002 | |
| 115,584 | 800 | .0024 | .0005 | |
| 130,032 | 900 | .0037 | .0012 | |
| 137,000 | 948 | .0042 | ..... | Ultimate strength. |

Marks, 191.
Composition: Alpha Portland cement, 1; sand, 5; ¾" trap rock, 10.
Water used in mortar, 118.57 per cent of cement.
Age, 4 months.
Weight per cubic foot, 134.3 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0003 | 0. | |
| 43,380 | 300 | .0011 | .0008 | |
| 57,840 | 400 | .0022 | .0011 | |
| 72,300 | 500 | .0057 | .0037 | |
| 86,760 | 600 | .0126 | .0097 | E=862,000 pounds per square inch. |
| 107 700 | 745 | ..... | ..... | Ultimate strength. |

Marks, 205.
Composition: Alpha Portland cement, 1; sand, 6; ¾" trap rock, 12.
Water used in mortar, 149.52 per cent of cement.
Age, 4 months.
Weight per cubic foot, 135 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0003 | 0. | |
| 43,380 | 300 | .0007 | .0001 | |
| 57,840 | 400 | .0012 | .0003 | |
| 72,300 | 500 | .0018 | .0006 | |
| 86,760 | 600 | .0025 | .0010 | E = 1,667,000 pounds per square inch. |
| 101,220 | 700 | .0040 | .0018 | |
| 115,680 | 800 | .0061 | .0034 | |
| 128,600 | 889 | .0144 | ..... | Ultimate strength. |

Marks, 217.
Composition: Alpha Portland cement, 1; sand, 2; ⅝″ trap rock, 2.
Water used in mortar, 48.89 per cent of cement.
Age, 3 months.
Weight per cubic foot, 137.7 pounds.
Sectional area, 145.32 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,532 | 100 | 0. | 0. | Initial load. |
| 29,064 | 200 | .0001 | 0. | |
| 43,596 | 300 | .0003 | 0. | |
| 58,128 | 400 | .0004 | 0. | |
| 72,660 | 500 | .0006 | 0. | |
| 87,192 | 600 | .0009 | 0. | E=2,778,000 pounds per square inch. |
| 101,724 | 700 | .0011 | 0. | |
| 116,256 | 800 | .0013 | 0. | |
| 130,788 | 900 | .0015 | .0001 | |
| 145,320 | 1,000 | .0019 | .0002 | E=2,647,000 pounds per square inch. |
| 174,384 | 1,200 | .0023 | .0002 | |
| 203,448 | 1,400 | .0030 | .0004 | |
| 232,512 | 1,600 | .0039 | .0007 | E=1,613,000 pounds per square inch |
| 261,576 | 1,800 | .0050 | .0010 | |
| 290,640 | 2,000 | .0065 | .0017 | |
| 319,704 | 2,200 | .0091 | .0030 | |
| 343,600 | 2,364 | ..... | ..... | Ultimate strength. |

Marks, 222.
Composition: Alpha Portland cement, 1; sand, 2; ⅝″ trap rock, 3.
Water used in mortar, 49.39 per cent of cement.
Age, 3 months.
Weight per cubic foot, 143.5 pounds.
Sectional area, 144 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,400 | 100 | 0. | 0. | Initial load. |
| 28,800 | 200 | .0001 | 0. | |
| 43,200 | 300 | .0003 | 0. | |
| 57,600 | 400 | .0006 | 0. | |
| 72,000 | 500 | .0007 | 0. | |
| 86,400 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 100,800 | 700 | .0011 | .0001 | |
| 115,200 | 800 | .0014 | .0001 | |
| 129,600 | 900 | .0017 | .0002 | |
| 144,000 | 1,000 | .0020 | .0003 | E=2,647,000 pounds per square inch. |
| 172,800 | 1,200 | .0029 | .0006 | |
| 201,600 | 1,400 | .0044 | .0014 | E=909,000 pounds per square inch. |
| 230,400 | 1,600 | .0069 | .0029 | |
| 259,200 | 1,800 | .0116 | .0061 | |
| 288,000 | 2,000 | .0191 | .0119 | |
| 309,900 | 2,152 | ..... | ..... | Ultimate strength. |

Marks, 228.
Composition: Alpha Portland cement, 1; sand, 2; ⅜″ trap rock, 5.
Water used in mortar, 57.28 per cent of cement.
Age, 3 months.
Weight per cubic foot, 140.5 pounds.
Sectional area, 143.88 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,388 | 100 | 0. | 0. | Initial load. |
| 28,776 | 200 | .0001 | 0. | |
| 43,164 | 300 | .0003 | 0. | |
| 57,552 | 400 | .0006 | 0. | |
| 71,940 | 500 | .0009 | .0001 | |
| 86,328 | 600 | .0012 | .0001 | E = 2,273,000 pounds per square inch. |
| 100,716 | 700 | .0015 | .0002 | |
| 115,104 | 800 | .0020 | .0004 | |
| 129,492 | 900 | .0024 | .0006 | |
| 143,880 | 1,000 | .0030 | .0008 | E = 2,045,000 pounds per square inch. |
| 172,656 | 1,200 | .0043 | .0014 | |
| 201,432 | 1,400 | .0067 | .0025 | |
| 230,208 | 1,600 | .0105 | .0050 | |
| 258,984 | 1,800 | .0220 | .0139 | |
| 263,000 | 1,828 | ..... | ..... | Ultimate strength. |

Marks, 235.
Composition: Alpha Portland cement, 1; sand, 2; ⅜″ trap rock, 6.
Water used in mortar, 60.29 per cent of cement.
Age, 3 months.
Weight per cubic foot, 142.9 pounds.
Sectional area, 144.12 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,412 | 100 | 0. | 0. | Initial load. |
| 28,824 | 200 | .0002 | 0. | |
| 43,236 | 300 | .0005 | .0001 | |
| 57,648 | 400 | .0008 | .0001 | |
| 72,060 | 500 | .0011 | .0001 | |
| 86,472 | 600 | .0014 | .0002 | E = 2,083,000 pounds per square inch. |
| 100,884 | 700 | .0019 | .0004 | |
| 115,296 | 800 | .0023 | .0005 | |
| 129,708 | 900 | .0030 | .0007 | |
| 144,120 | 1,000 | .0037 | .0010 | E = 1,667,000 pounds per square inch. |
| 172,944 | 1,200 | .0059 | .0021 | |
| 201,768 | 1,400 | .0096 | .0042 | |
| 230,592 | 1,600 | .0174 | .0097 | |
| 267,100 | 1,853 | ..... | ..... | Ultimate strength. |

Marks, 243.
Composition: Alpha Portland cement, 1; sand, 2; $\frac{1}{8}$″ trap rock, 7.
Water used in mortar, 61.35 per cent of cement.
Age, 3 months.
Weight per cubic foot, 132.5 pounds.
Sectional area, 144.24 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,424 | 100 | 0. | 0. | Initial load. |
| 28,848 | 200 | .0002 | .0001 | |
| 43,272 | 300 | .0007 | .0001 | |
| 57,696 | 400 | .0012 | .0004 | |
| 72,120 | 500 | .0020 | .0007 | |
| 86,544 | 600 | .0031 | .0018 | E = 1,389,000 pounds per square inch. |
| 100,968 | 700 | .0052 | .0027 | |
| 115,392 | 800 | .0082 | .0049 | |
| 129,816 | 900 | .0140 | .0096 | |
| 141,800 | 983 | ..... | ..... | Ultimate strength. |

Marks, 252.
Composition: Alpha Portland cement, 1; sand, 2; $\frac{1}{8}$″ trap rock, 8.
Water used in mortar, 66.67 per cent of cement.
Age, 3 months.
Weight per cubic foot, 130.7 pounds.
Sectional area, 145.08 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,508 | 100 | 0. | 0. | Initial load. |
| 29,016 | 200 | .0003 | 0. | |
| 43,524 | 300 | .0007 | .0001 | |
| 58,032 | 400 | .0011 | .0002 | |
| 72,540 | 500 | .0018 | .0005 | |
| 87,048 | 600 | .0030 | .0011 | E = 1,316,000 pounds per square inch. |
| 101,556 | 700 | .0054 | .0028 | |
| 116,064 | 800 | .0121 | .0081 | |
| 130,572 | 900 | .0290 | .0232 | Ultimate strength. |

Marks, 263.
Composition: Alpha Portland cement, 1; sand, 2; $\frac{3}{8}$″ trap rock, 9.
Water used in mortar, 72.38 per cent of cement.
Age, 3 months.
Weight per cubic foot, 133.1 pounds.
Sectional area 144.24 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,424 | 100 | 0. | 0. | Initial load. |
| 28,848 | 200 | .0002 | 0. | |
| 43,272 | 300 | .0010 | .0002 | |
| 57,696 | 400 | .0019 | .0006 | |
| 72,120 | 500 | .0036 | .0016 | |
| 86,544 | 600 | .0071 | .0042 | E = 862,000 pounds per square inch. |
| 100,968 | 700 | .0148 | .0100 | |
| 115,200 | 799 | ..... | ..... | Ultimate strength. |

Marks, 264.
Composition: Alpha Portland cement, 1; sand, 2; $1\frac{1}{2}$″ trap rock, 2.
Water used in mortar, 47.26 per cent of cement.
Age, 3 months.
Weight per cubic foot, 140.5 pounds.
Sectional area, 144.24 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds* | *Inch.* | *Inch.* | |
| 14,424 | 100 | 0. | 0. | Initial load. |
| 28,848 | 200 | .0001 | 0. | |
| 43,272 | 300 | .0008 | 0. | |
| 57,696 | 400 | .0005 | 0. | |
| 72,120 | 500 | .0007 | 0. | |
| 86,544 | 600 | .0010 | .0001 | E = 2,778,000 pounds per square inch. |
| 100,968 | 700 | .0012 | .0001 | |
| 115,392 | 800 | .0014 | .0002 | |
| 129,816 | 900 | .0016 | .0003 | |
| 144,240 | 1,000 | .0020 | .0004 | E = 2,812,000 pounds per square inch. |
| 173,088 | 1,200 | .0028 | .0006 | |
| 201,936 | 1,400 | .0038 | .0010 | |
| 230,784 | 1,600 | .0055 | .0019 | |
| 259,632 | 1,800 | .0098 | .0044 | |
| 268,000 | 1,823 | ..... | ..... | Ultimate strength. |

Marks, 272.
Composition: Alpha-Portland cement, 1; sand, 2; 1½″ trap rock, 3.
Water used in mortar, 50.98 per cent of cement.
Age, 3 months.
Weight per cubic foot, 146.9 pounds.
Sectional area, 144.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,448 | 100 | 0. | 0. | Initial load. |
| 28,896 | 200 | .0001 | 0. | |
| 43,344 | 300 | .0004 | 0. | |
| 57,792 | 400 | .0005 | 0. | |
| 72,240 | 500 | .0009 | .0002 | |
| 86,688 | 600 | .0012 | .0003 | E=2,778,000 pounds per square inch. |
| 101,136 | 700 | .0015 | .0004 | |
| 115,584 | 800 | .0018 | .0007 | |
| 130,032 | 900 | .0024 | .0009 | |
| 144,480 | 1,000 | .0030 | .0012 | E=2,500,000 pounds per square inch. |
| 173,376 | 1,200 | .0048 | .0023 | |
| 202,272 | 1,400 | .0075 | .0041 | |
| 231,168 | 1,600 | .0114 | .0072 | |
| 260,064 | 1,800 | .0163 | .0110 | |
| 290,200 | 2,009 | ..... | ..... | Ultimate strength. |

Marks, 274.
Composition: Alpha-Portland cement, 1; sand, 2; 1½″ trap rock, 4.
Water used in mortar 55.56 per cent of cement.
Age, 3 months.
Weight per cubic foot, 151.1 pounds.
Sectional area, 144.36 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,436 | 100 | 0. | 0. | Initial load. |
| 28,872 | 200 | .0002 | 0. | |
| 43,308 | 300 | .0004 | .0001 | |
| 57,744 | 400 | .0007 | .0001 | |
| 72,180 | 500 | .0010 | .0002 | |
| 86,616 | 600 | .0013 | .0004 | E=2,778,000 pounds per square inch. |
| 101,052 | 700 | .0015 | .0005 | |
| 115,488 | 800 | .0019 | .0006 | |
| 129,924 | 900 | .0023 | .0008 | |
| 144,360 | 1,000 | .0029 | .0010 | E=2,368,000 pounds per square inch. |
| 173,232 | 1,200 | .0040 | .0015 | |
| 202,104 | 1,400 | .0051 | .0021 | |
| 230,976 | 1,600 | .0065 | .0028 | |
| 259,848 | 1,800 | .0076 | .0031 | |
| 288,720 | 2,000 | .0076 | .0025 | First crack. |
| 317,500 | 2,199 | ..... | ..... | Ultimate strength. |

Marks, 278.
Composition: Alpha-Portland cement, 1; sand, 2; 1½″ trap rock, 5.
Water used in mortar, 46.46 per cent of cement.
Age, 3 months.
Weight per cubic foot, 152.0 pounds.
Sectional area, 145.08 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,508 | 100 | 0. | 0. | Initial load. |
| 29,016 | 200 | .0001 | 0. | |
| 43,524 | 300 | .0004 | 0. | |
| 58,032 | 400 | .0007 | .0001 | |
| 72,540 | 500 | .0010 | .0002 | |
| 87,048 | 600 | .0013 | .0002 | E=2,273,000 pounds per square inch. |
| 101,556 | 700 | .0015 | .0003 | |
| 116,064 | 800 | .0019 | .0005 | |
| 130,572 | 900 | .0022 | .0006 | |
| 145,080 | 1,000 | .0026 | .0007 | E=2,368,000 pounds per square inch. |
| 174,096 | 1,200 | .0036 | .0011 | |
| 203,112 | 1,400 | .0047 | .0014 | |
| 232,128 | 1,600 | .0063 | .0023 | E=1,250,000 pounds per square inch. |
| 261,144 | 1,800 | .0085 | .0035 | |
| 290,160 | 2,000 | .0111 | .0052 | |
| 391,100 | 2,696 | ..... | ..... | Tensile strength. |

Marks, 286.
Composition: Alpha-Portland cement, 1; sand, 2; 1½″ trap rock, 6.
Water used in mortar, 64.68 per cent of cement.
Age, 3 months.
Weight per cubic foot, 154.3 pounds.
Sectional area, 144.96 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,496 | 100 | 0. | 0. | Initial load. |
| 28,992 | 200 | .0002 | 0. | |
| 43,488 | 300 | .0006 | .0001 | |
| 57,984 | 400 | .0010 | .0003 | |
| 72,480 | 500 | .0013 | .0005 | |
| 86,976 | 600 | .0018 | .0007 | E=2,273,000 pounds per square inch. |
| 101,472 | 700 | .0024 | .0010 | |
| 115,968 | 800 | .0029 | .0012 | |
| 130,464 | 900 | .0035 | .0014 | |
| 144,960 | 1,000 | .0042 | .0017 | E=1,800,000 pounds per square inch. |
| 173,952 | 1,200 | .0057 | .0026 | |
| 202,944 | 1,400 | .0076 | .0037 | |
| 231,936 | 1,600 | .0097 | .0051 | E=1,429,000 pounds per square inch. |
| 260,928 | 1,800 | .0123 | .0071 | |
| 289,920 | 2,000 | .0156 | .0096 | |
| 318,000 | ..... | ..... | ..... | First crack. |
| 318,912 | 2,200 | .0201 | .0131 | |
| 368,000 | 2,539 | ..... | ..... | Ultimate strength. |

Marks, 295.
Composition: Alpha-Portland cement, 1; sand, 2; 1½″ trap rock, 7.
Water used in mortar 70.24 per cent of cement.
Age, 3 months.
Weight per cubic foot, 148.7 pounds.
Sectional area, 144.36 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,436 | 100 | 0. | 0. | Initial load. |
| 28,872 | 200 | .0003 | 0. | |
| 43,308 | 300 | .0009 | .0003 | |
| 57,744 | 400 | .0015 | .0006 | |
| 72,280 | 500 | .0024 | .0011 | |
| 86,616 | 600 | .0036 | .0018 | E=1,389,000 pounds per square inch. |
| 101,052 | 700 | .0052 | .0031 | |
| 115,488 | 800 | .0075 | .0045 | |
| 129,924 | 900 | .0101 | .0064 | |
| 144,360 | 1,000 | .0133 | .0089 | E=1,023,000 pounds per square inch. |
| 173,232 | 1,200 | .0200 | .0142 | First crack. |
| 221,500 | 1,534 | ..... | ..... | Ultimate strength. |

Marks, 301.
Composition: Alpha Portland cement, 1; sand, 2; 1½″ trap rock, 8.
Water used in mortar, 70.47 per cent of cement.
Age, 3 months.
Weight per cubic foot, 141.7 pounds.
Sectional area, 145.56 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,556 | 100 | 0. | 0. | Initial load. |
| 29,112 | 200 | .0003 | .0001 | |
| 43,668 | 300 | .0007 | .0002 | |
| 58,224 | 400 | .0013 | .0006 | |
| 72,780 | 500 | .0020 | .0010 | |
| 87,336 | 600 | .0034 | .0018 | E=1,562,000 pounds per square inch. |
| 101,892 | 700 | .0050 | .0030 | |
| 116,448 | 800 | .0071 | .0044 | |
| 131,004 | 900 | .0099 | .0062 | |
| 145,560 | 1,000 | .0140 | .0094 | E=978,000 pounds per square inch. |
| 160,116 | 1,100 | .0230 | .0167 | First crack. |
| 161,400 | 1,109 | ..... | ..... | Ultimate strength. |

Marks, 402.
Composition: Alpha Portland cement, 1; sand, 2; 2½" trap rock, 4.
Water used in mortar 63.32 per cent of cement.
Age, 3 months.
Weight per cubic foot, 152.1 pounds.
Sectional area, 144.72 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,472 | 100 | 0. | 0. | Initial load. |
| 28,944 | 200 | .0001 | 0. | |
| 43,416 | 300 | .0005 | 0. | |
| 57,888 | 400 | .0007 | .0001 | |
| 72,360 | 500 | .0011 | .0004 | |
| 86,832 | 600 | .0014 | .0005 | E=2,778,000 pounds per square inch. |
| 101,304 | 700 | .0020 | .0008 | |
| 115,776 | 800 | .0024 | .0010 | |
| 130,248 | 900 | .0029 | .0012 | |
| 144,720 | 1,000 | .0036 | .0016 | E=2,250,000 pounds per square inch. |
| 173,664 | 1,200 | .0050 | .0023 | |
| 202,608 | 1,400 | .0068 | .0034 | |
| 231,552 | 1,600 | .0090 | .0047 | |
| 260,496 | 1,800 | .0123 | .0074 | |
| 281,000 | ..... | ..... | ..... | First crack. |
| 289,440 | 2,000 | .0174 | .0110 | |
| 318,384 | 2,200 | .0220 | .0150 | Ultimate strength.<br>Failed upon the second application of the maximum load. |

Marks, 411.
Composition: Steel Portland cement, 1; sand, 2; 2½" trap rock, 4.
Water used in mortar 64.67 per cent cement.
Age, 3 months.
Weight per cubic foot, 151.6 pounds.
Sectional area, 144.60 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,460 | 100 | 0. | 0. | Initial load. |
| 28,920 | 200 | .0002 | .0001 | |
| 43,380 | 300 | .0005 | .0001 | |
| 57,840 | 400 | .0008 | .0002 | |
| 72,300 | 500 | .0011 | .0003 | |
| 86,760 | 600 | .0015 | .0005 | E=2,500,000 pounds per square inch. |
| 101,220 | 700 | .0020 | .0008 | |
| 115,680 | 800 | .0026 | .0013 | |
| 130,140 | 900 | .0039 | .0022 | |
| 144,600 | 1,000 | .0048 | .0030 | E=2,500,000 pounds per square inch. |
| 173,520 | 1,200 | .0086 | .0060 | |
| 202,440 | 1,400 | .0132 | .0099 | |
| 231,360 | 1,600 | .0202 | .0158 | First crack. |
| 251,000 | 1,736 | ..... | ..... | Ultimate strength. |

Marks, 431.
Composition: Norton's Rosendale cement, 1; sand, 2; 2½" trap rock, 4.
Water used in mortar, 70.13 per cent of cement.
Age, 3 months.
Weight per cubic foot, 145.9 pounds.
Sectional area, 144.36 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 7,218 | 50 | 0. | 0. | Initial load. |
| 14,436 | 100 | .0029 | .0027 | |
| 21,654 | 150 | .0068 | .0055 | |
| 28,872 | 200 | .0161 | .0149 | First crack. |
| 32,600 | 226 | .0300 | ..... | |
| 56,200 | 389 | ..... | ..... | Ultimate strength. |

Marks, 435.
Composition: Norton's Rosendale cement, 1; sand, 2.
Water used in mortar, 51.91 per cent of cement.
Age, 3 months.
Weight per cubic foot, 122 pounds.
Sectional area, 145.08 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 7,254 | 50 | 0. | 0. | Initial load. |
| 14,508 | 100 | .0005 | .0002 | |
| 21,762 | 150 | .0018 | .0009 | |
| 29,016 | 200 | .0048 | .0031 | |
| 33,200 | 229 | .0090 | ..... | First crack. |
| 42,200 | 291 | ..... | ..... | Ultimate strength. |

Marks, 446.
Composition: Alpha Portland cement, 1; sand, 2; 1½″ to 3″ pebbles, 4.
Water used in mortar, 48.68 per cent of cement.
Age, 3 months.
Weight per cubic foot, 145.9 pounds.
Sectional area, 144.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,472 | 100 | 0. | 0. | Initial load. |
| 28,944 | 200 | .0001 | 0. | |
| 43,416 | 300 | .0003 | 0. | |
| 57,888 | 400 | .0005 | 0. | |
| 72,360 | 500 | .0007 | .0001 | |
| 86,832 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 101,304 | 700 | .0011 | .0002 | |
| 115,776 | 800 | .0012 | .0002 | |
| 130,248 | 900 | .0014 | .0003 | |
| 144,720 | 1,000 | .0016 | .0003 | E=3,461,000 pounds per square inch. |
| 173,664 | 1,200 | .0021 | .0005 | |
| 202,608 | 1,400 | .0025 | .0005 | |
| 231,552 | 1,600 | .0029 | .0006 | E=3,333,000 pounds per square inch. |
| 260,496 | 1,800 | .0032 | .0006 | |
| 289,440 | 2,000 | .0035 | .0007 | |
| 318,384 | 2,200 | .0040 | .0008 | |
| 347,328 | 2,400 | .0044 | .0009 | |
| 376,272 | 2,600 | .0051 | .0010 | |
| 405,216 | 2,800 | .0060 | .0012 | |
| 434,160 | 3,000 | .0078 | .0014 | |
| 440,000 | ..... | ..... | ..... | First crack. |
| 463,104 | 3,200 | .0086 | .0009 | Ultimate strength. |

Marks, 456.
Composition: Alpha Portland cement, 1; sand, 2; 1½″ to 2½″ broken brick, 4.
Water used in mortar, 64.69 per cent of cement.
Age, 3 months.
Weight per cubic foot, 130.3 pounds.
Sectional area, 145.08 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,508 | 100 | 0. | 0. | Initial load. |
| 29,016 | 200 | .0003 | 0. | |
| 43,524 | 300 | .0004 | 0. | |
| 58,032 | 400 | .0007 | .0001 | |
| 72,540 | 500 | .0009 | .0001 | |
| 87,048 | 600 | .0012 | .0002 | E=2,500,000 pounds per square inch. |
| 101,556 | 700 | .0014 | .0002 | |
| 116,064 | 800 | .0017 | .0003 | |
| 130,572 | 900 | .0021 | .0004 | |
| 145,080 | 1,000 | .0024 | .0005 | E=2,868,000 pounds per square inch. |
| 174,096 | 1,200 | .0033 | .0007 | |
| 203,112 | 1,400 | .0042 | .0009 | |
| 232,128 | 1,600 | .0055 | .0014 | E=1,020,000 pounds per square inch. |
| 261,144 | 1,800 | .0071 | .0019 | |
| 290,160 | 2,000 | .0101 | .0033 | |
| 319,176 | 2,200 | .0151 | .0056 | First crack. |
| 348,192 | 2,400 | .0230 | .0090 | |
| 360,500 | 2,485 | ..... | ..... | Ultimate strength. |

Marks, 466.

Composition: Alpha Portland cement, 1; sand, 3; 1½″ to 2½″ broken brick, 6.

Water used in mortar, 82.82 per cent of cement.

Age, 3 months.

Weight per cubic foot, 128.9 pounds.

Sectional area, 145.32 square inches.

Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,532 | 100 | 0. | 0. | Initial load. |
| 29,064 | 200 | .0001 | 0. | |
| 43,596 | 300 | .0004 | 0. | |
| 58,128 | 400 | .0007 | 0. | |
| 72,660 | 500 | .0009 | 0. | |
| 87,192 | 600 | .0011 | 0. | E=2,273,000 pounds per square inch. |
| 101,724 | 700 | .0014 | 0. | |
| 116,256 | 800 | .0017 | .0001 | |
| 130,788 | 900 | .0020 | .0002 | |
| 145,320 | 1,000 | .0024 | .0003 | E=2,143,000 pounds per square inch. |
| 174,384 | 1,200 | .0033 | .0005 | |
| 203,448 | 1,400 | .0043 | .0010 | |
| 232,512 | 1,600 | .0054 | .0015 | E=1,250,000 pounds per square inch. |
| 261,576 | 1,800 | .0073 | .0022 | |
| 290,640 | 2,000 | .0099 | .0038 | |
| 319,704 | 2,200 | .0132 | .0056 | |
| 321,000 | ..... | ..... | ..... | First crack. |
| 348,768 | 2,400 | .0188 | .0087 | Ultimate strength. |

Marks, 483.
Composition: Alpha Portland cement, 1; granite dust, 1.
Water used in mortar, 32.46 per cent of cement.
Age, 3 months.
Weight per cubic foot, 136.9 pounds.
Sectional area, 145.32 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,532 | 100 | 0. | 0. | Initial load. |
| 29,064 | 200 | .0002 | 0. | |
| 58,128 | 400 | .0005 | .0001 | |
| 87,192 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 116,256 | 800 | .0010 | .0001 | |
| 145,320 | 1,000 | .0012 | 0. | E=3,750,000 pounds per square inch. |
| 174,384 | 1,200 | .0013 | —.0001 | |
| 203,448 | 1,400 | .0014 | —.0001 | |
| 232,512 | 1,600 | .0016 | —.0002 | E=5,000,000 pounds per square inch. |
| 261,576 | 1,800 | .0018 | —.0002 | |
| 290,640 | 2,000 | .0020 | —.0002 | |
| 319,704 | 2,200 | .0021 | —.0002 | |
| 348,768 | 2,400 | .0023 | —.0001 | |
| 377,832 | 2,600 | .0025 | —.0001 | |
| 406,896 | 2,800 | .0027 | —.0001 | |
| 435,960 | 3,000 | .0030 | 0. | |
| 465,024 | 3,200 | .0032 | 0. | |
| 494,088 | 3,400 | .0034 | 0. | |
| 523,152 | 3,600 | .0037 | .0001 | |
| 552,216 | 3,800 | .0039 | .0001 | |
| 581,280 | 4,000 | .0042 | .0001 | |
| 610,344 | 4,200 | .0043 | .0001 | |
| 639,408 | 4,400 | .0047 | .0002 | |
| 668,472 | 4,600 | .0050 | .0003 | |
| 697,536 | 4,800 | .0054 | .0004 | |
| 726,600 | 5,000 | .0057 | .0004 | |
| 755,664 | 5,200 | .0060 | .0005 | First crack. |
| 784,728 | 5,400 | .0064 | .0006 | |
| 810,000 | 5,574 | .0105 | ..... | Ultimate strength. Sustained the maximum load 1 minute, then failed. |

Marks, 485.
Composition: Alpha Portland cement, 1; granite dust, 2.
Water used in mortar, 40.18 per cent of cement.
Age, 3 months.
Weight per cubic foot, 134.1 pounds.
Sectional area, 145.68 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,568 | 100 | 0. | 0. | Initial load. |
| 29,136 | 200 | .0002 | 0. | |
| 58,272 | 400 | .0005 | 0. | |
| 87,408 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 116,544 | 800 | .0010 | .0001 | |
| 145,680 | 1,000 | .0012 | .0001 | E=4,091,000 pounds per square inch. |
| 174,816 | 1,200 | .0015 | .0001 | |
| 203,952 | 1,400 | .0017 | .0001 | |
| 233,088 | 1,600 | .0020 | .0002 | E=3,846,000 pounds per square inch. |
| 262,224 | 1,800 | .0023 | .0002 | |
| 291,360 | 2,000 | .0027 | .0003 | |
| 320,496 | 2,200 | .0030 | .0004 | |
| 349,632 | 2,400 | .0033 | .0004 | |
| 378,768 | 2,600 | .0035 | .0005 | |
| 407,904 | 2,800 | .0039 | .0005 | |
| 437,040 | 3,000 | .0042 | .0005 | |
| 466,176 | 3,200 | .0044 | .0005 | |
| 495,312 | 3,400 | .0048 | .0005 | |
| 524,448 | 3,600 | .0052 | .0006 | |
| 553,584 | 3,800 | .0056 | .0007 | |
| 582,720 | 4,000 | .0059 | .0007 | |
| 611,856 | 4,200 | .0063 | .0006 | |
| 640,992 | 4,400 | .0068 | .0004 | |
| 650,500 | 4,465 | ..... | ..... | Ultimate strength. |

Marks, 489.
Composition: Alpha Portland cement, 1; granite dust, 3.
Water used in mortar, 53.15 per cent of cement.
Age, 3 months.
Weight per cubic foot, 127.6 pounds.
Sectional area, 145.20 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,520 | 100 | 0. | 0. | Initial load. |
| 29,040 | 200 | .0002 | 0. | |
| 58,080 | 400 | .0007 | .0001 | |
| 87,120 | 600 | .0011 | .0002 | E=2,778,000 pounds per square inch. |
| 116,160 | 800 | .0016 | .0002 | |
| 145,200 | 1,000 | .0020 | .0002 | E=2,500,000 pounds per square inch. |
| 174,240 | 1,200 | .0026 | .0003 | |
| 203,280 | 1,400 | .0034 | .0004 | |
| 232,320 | 1,600 | .0042 | .0006 | E=1,562,000 pounds per square inch. |
| 261,360 | 1,800 | .0053 | .0011 | |
| 290,400 | 2,000 | .0065 | .0015 | |
| 319,440 | 2,200 | .0084 | .0023 | |
| 348,480 | 2,400 | .0120 | .0043 | |
| 365,000 | 2,514 | ..... | ..... | Ultimate strength. |

Marks, 494.
Composition: Alpha Portland cement, 1; granite dust, 2; 2½" trap rock, 4.
Water used in mortar, 59.09 per cent of cement.
Age, 3 months.
Weight per cubic foot, 154.2 pounds.
Sectional area, 145.44 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,544 | 100 | 0. | 0. | Initial load. |
| 29,088 | 200 | .0002 | 0. | |
| 58,176 | 400 | .0006 | .0001 | |
| 87,264 | 600 | .0013 | .0003 | E=2,500,000 pounds per square inch. |
| 116,352 | 800 | .0021 | .0007 | |
| 145,440 | 1,000 | .0033 | .0011 | E=2,045,000 pounds per square inch. |
| 174,528 | 1,200 | .0045 | .0018 | |
| 203,616 | 1,400 | .0063 | .0027 | |
| 232,704 | 1,600 | .0088 | .0044 | E=1,351,000 pounds per square inch. |
| 261,792 | 1,800 | .0113 | .0060 | |
| 290,880 | 2,000 | .0146 | .0087 | |
| 292,000 | ..... | ..... | ..... | First crack. |
| 319,968 | 2,200 | .0184 | .0117 | |
| 349,056 | 2,400 | .0223 | .0147 | |
| 401,400 | 2,760 | ..... | ..... | Ultimate strength. |

FOUR CUBES OF CONCRETE MADE FROM A LOT OF CEMENT WHICH HAD BEEN IN STORE. THE CEMENT HAD SWELLED IN THE BARREL.

Marks, 78.
Composition: Alsen cement, 1; fine sand, 1; broken stone, 3. (¾" ring stone.)
Water used in mortar, 35.26 per cent of cement.
Age, 11 days.
Set in mold, 1 day; in water, 10 days.
Weight per cubic foot, 146.15 pounds.
Sectional area, 145.44 square inches.
Gauged length, 5".

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,544 | 100 | 0. | 0. | Initial load. |
| 29,088 | 200 | .0002 | 0. | |
| 43,632 | 300 | .0004 | .0001 | |
| 58,176 | 400 | .0007 | .0001 | |
| 72,720 | 500 | .0010 | .0002 | |
| 87,264 | 600 | .0014 | .0004 | E=2,500,000 pounds per square inch. |
| 101,808 | 700 | .0019 | .0006 | |
| 116,352 | 800 | .0025 | .0009 | |
| 130,896 | 900 | .0034 | .0014 | |
| 145,440 | 1,000 | .0046 | .0022 | E=1,875,000 pounds per square inch. |
| 174,528 | 1,200 | .0091 | .0054 | |
| 193,700 | 1,332 | ..... | ..... | Ultimate strength. |

Marks, 79.
Composition: Alsen cement, 1; fine sand, 1; broken stone, 3. (½″ ring stone.)
Water used in mortar, 35.26 per cent of cement.
Age, 26 days.
Set in mold, 1 day; in water, 25 days.
Weight per cubic foot, 149.01 pounds.
Sectional area, 144.84 square inches.
Gauged length, 5″.

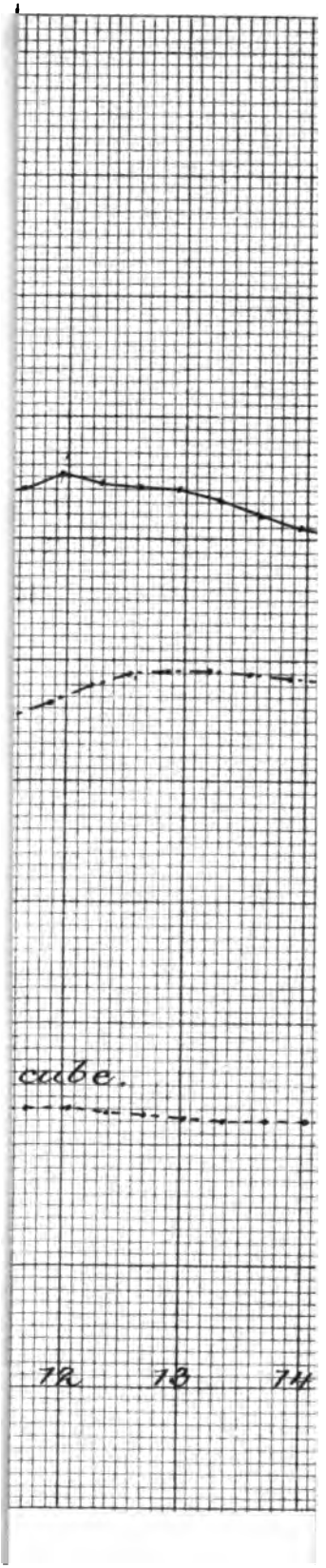
| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0001 | 0. | |
| 43,452 | 300 | .0002 | 0. | |
| 57,936 | 400 | .0003 | 0. | |
| 72,420 | 500 | .0004 | 0. | |
| 86,904 | 600 | .0005 | 0. | E=5,000,000 pounds per square inch. |
| 101,388 | 700 | .0007 | 0. | |
| 115,872 | 800 | .0010 | 0. | |
| 130,356 | 900 | .0012 | 0. | |
| 144,840 | 1,000 | .0015 | 0. | E=3,000,000 pounds per square inch. |
| 173,808 | 1,200 | .0019 | .0001 | |
| 202,776 | 1,400 | .0030 | .0008 | |
| 222,600 | 1,587 | ..... | ..... | Ultimate strength. |

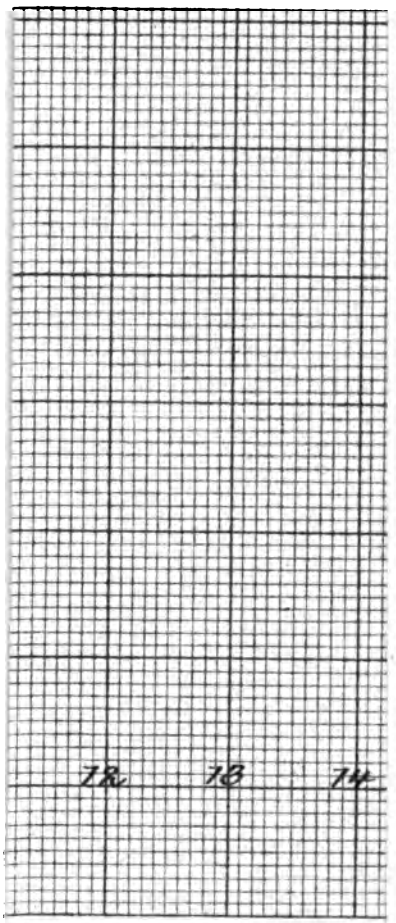
Marks, 80.
Composition: Alsen cement, 1; fine sand, 1; broken stone, 3. (½″ ring stone.)
Water used in mortar, 35.26 per cent of cement.
Age, 41 days.
Set in mold, 1 day; in water, 40 days.
Weight per cubic foot, 148.63 pounds.
Sectional area, 144.84 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 14,484 | 100 | 0. | 0. | Initial load. |
| 28,968 | 200 | .0001 | 0. | |
| 43,452 | 300 | .0003 | 0. | |
| 57,936 | 400 | .0004 | 0. | |
| 72,420 | 500 | .0006 | 0. | |
| 86,904 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 101,388 | 700 | .0010 | .0001 | |
| 115,872 | 800 | .0012 | .0002 | |
| 130,356 | 900 | .0014 | .0002 | |
| 144,840 | 1,000 | .0018 | .0003 | E=3,000,000 pounds per square inch. |
| 173,808 | 1,200 | .0024 | .0005 | |
| 202,776 | 1,400 | .0033 | .0008 | E=1,351,000 pounds per square inch. |
| 231,744 | 1,600 | .0048 | .0016 | |
| 260,712 | 1,800 | .0064 | .0022 | |
| 289,680 | 2,000 | .0090 | .0038 | |
| 318,648 | 2,200 | .0158 | ..... | Ultimate strength. |

Marks, 81.
Composition: Alsen cement, 1; fine sand, 1; broken stone, 3. ($\frac{3}{4}$″ ring stone.)
Water used in mortar, 35.26 per cent of cement.
Age, 48 days.
Set in mold, 1 day; in water, 47 days.
Weight per cubic foot, 151.37 pounds.
Sectional area, 145.44 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 15,544 | 100 | 0. | 0. | Initial load. |
| 29,088 | 200 | .0001 | 0. | |
| 43,632 | 300 | .0004 | .0001 | |
| 58,176 | 400 | .0007 | .0001 | |
| 72,720 | 500 | .0009 | .0002 | |
| 87,264 | 600 | .0011 | .0002 | E=2,778,000 pounds per square inch. |
| 101,808 | 700 | .0013 | .0003 | |
| 116,352 | 800 | .0016 | .0004 | |
| 130,896 | 900 | .0019 | .0005 | |
| 145,440 | 1,000 | .0023 | .0006 | E=2,647,000 pounds per square inch. |
| 174,528 | 1,200 | .0030 | .0008 | |
| 203,616 | 1,400 | .0038 | .0011 | E=1,515,000 pounds per square inch. |
| 232,704 | 1,600 | .0050 | .0017 | |
| 261,792 | 1,800 | .0064 | .0024 | |
| 290,880 | 2,000 | .0087 | .0037 | |
| 319,968 | 2,200 | .0120 | .0058 | |
| 349,056 | 2,400 | .0180 | .0099 | First crack. |
| 378,144 | 2,600 | .0270 | .0170 | Ultimate strength. |


свбе.
72
73
74


12
13
14

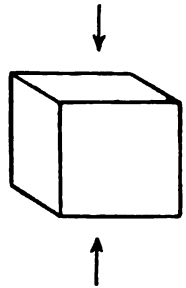
# CONCRETE

FROM

# U. S. ENGINEER CORPS, KEY WEST, FLA.

835

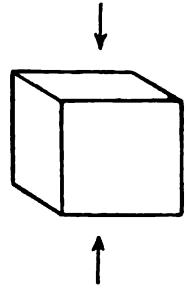
## CONCRETE FROM U. S. ENGINEER CORPS.



The cubes were allowed to set 1 day in air and 27 days in water, and balance of time in air. Age when tested about three months.

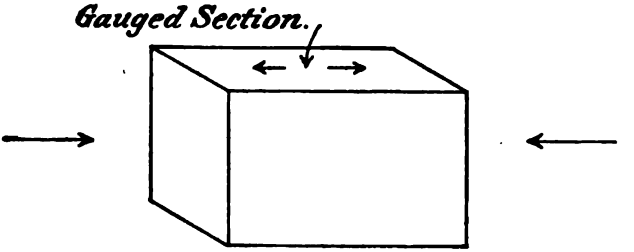
| No. of test. | Marks. | Composition. Portland cement. | Composition. Sand and broken brick. | Weight. | | Weight per cubic foot. | Dimensions. Height. | Dimensions. Compressed surface. | | Sectional area. | First Crack. | Ultimate strength. Total. | Ultimate strength. Per square inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *Lbs.* | *Oz.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. Inches.* | *Pounds.* | *Pounds.* | *Pounds.* |
| 9659 | 1 | 1 | 4—Broken brick that passed a screen having meshes ¾ of an inch diameter | 13 | 0 | 102.6 | 6.04 | 6.03 | 6.01 | 36.24 | 35,380 | 35,380 | 976 |
| 9660 | 1 | | | 13 | 1 | 102.6 | 6.02 | 6.06 | 6.04 | 36.60 | 30,100 | 30,100 | 822 |
| 9661 | 2 | 1 | 2—Powdered brick that passed through a No. 20 sieve... | 12 | 5 | 97.5 | 6.02 | 6.03 | 6.01 | 36.24 | 37,100 | 37,100 | 1,024 |
| 9662 | 2 | | | 13 | 4½ | 104.3 | 6.04 | 6.05 | 6.02 | 36.42 | 58,200 | 58,200 | 1,598 |
| 9663 | 3 | 1 | 2—Coral sand; the sand screened through a No. 20 sieve. | 12 | 10½ | 100.1 | 6.03 | 6.02 | 6.01 | 36.18 | 18,200 | 18,200 | 503 |
| 9664 | 3 | | | 12 | 15½ | 102.8 | 6.04 | 6.00 | 6.02 | 36.12 | 30,700 | 30,700 | 850 |
| 9665 | 4 | 1 | 2—Sand that passed through a No. 20 sieve | 13 | 4 | 104.6 | 6.03 | 6.04 | 6.01 | 36.30 | 25,300 | 25,300 | 697 |
| 9666 | 4 | | 4—Broken brick passed by ¾" screen and retained by No. 20 sieve | 13 | 10½ | 107.1 | 6.07 | 6.04 | 6.02 | 36.36 | 31,400 | 31,400 | 864 |
| 9667 | 5 | 1 | 2—Coral sand that passed through a No. 20 sieve | 13 | 3½ | 104.5 | 6.06 | 6.01 | 6.00 | 36.06 | 24,750 | 24,750 | 686 |
| 9668 | 5 | | 4—Broken brick passed by ¾" screen and retained by No. 20 sieve | 13 | 8½ | 105.5 | 6.10 | 6.04 | 6.01 | 36.30 | 25,620 | 25,620 | 706 |

## CONCRETE FROM U. S. ENGINEER CORPS.



The cubes were allowed to set 1 day in air and 27 days in water, and balance of time in air. Age when tested about three months.

| No. of test. | Marks. | Composition. | | Weight. | | Weight per cubic foot. | Dimensions. | | | Sectional area. | First Crack. | Ultimate strength. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Portland cement. | Sand and broken brick. | | | | Height. | Compressed surface. | | | | Total. | Per square inch. |
| | | | | *Lbs.* | *Oz.* | *Pounds.* | *Inches.* | *Inches.* | *Inches.* | *Sq. Inches.* | *Pounds.* | *Pounds.* | *Pounds.* |
| 9659 | 1 | 1 | 4—Broken brick that passed a screen having meshes ½ | 13 | 0 | 102.6 | 6.04 | 6.03 | 6.01 | 36.24 | 35,380 | 35,380 | 976 |
| 9660 | 1 | | of an inch diameter | 13 | 1 | 102.6 | 6.02 | 6.06 | 6.04 | 36.60 | 30,100 | 30,100 | 822 |
| 9661 | 2 | 1 | 2—Powdered brick that passed through a No. 20 sieve... | 12 | 5 | 97.5 | 6.02 | 6.03 | 6.01 | 36.24 | 37,100 | 37,100 | 1,024 |
| 9662 | 2 | | | 13 | 4½ | 104.3 | 6.04 | 6.05 | 6.02 | 36.42 | 58,200 | 58,200 | 1,598 |
| 9663 | 3 | 1 | 2—Coral sand; the sand screened through a No. 20 sieve. | 12 | 10½ | 100.1 | 6.03 | 6.02 | 6.01 | 36.18 | 18,200 | 18,200 | 503 |
| 9664 | 3 | | | 12 | 15½ | 102.8 | 6.04 | 6.00 | 6.02 | 36.12 | 30,700 | 30,700 | 850 |
| 9665 | 4 | 1 | 2—Sand that passed through a No. 20 sieve | 13 | 4 | 104.6 | 6.03 | 6.04 | 6.01 | 36.30 | 25,300 | 25,300 | 697 |
| 9666 | 4 | | 4—Broken brick passed by ½" screen and retained by No. 20 sieve | 13 | 10½ | 107.1 | 6.07 | 6.04 | 6.02 | 36.36 | 31,400 | 31,400 | 864 |
| 9667 | 5 | 1 | 2—Coral sand that passed through a No. 20 sieve | 13 | 3½ | 104.5 | 6.06 | 6.01 | 6.00 | 36.06 | 24,750 | 24,750 | 686 |
| 9668 | 5 | | 4—Broken brick passed by ½" screen and retained by No. 20 sieve | 13 | 8½ | 105.5 | 6.10 | 6.04 | 6.01 | 36.30 | 25,620 | 25,620 | 706 |




Composition: Alsen cement, 1; sand, 2; broken stone, 4.

The mortar was made first and then 4 parts of broken stone from ¼″ to ½″ diameter added.

| No. of test. | Marks. | Age. | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Height. | Compressed surface. | | | | Total. | Per square inch. |
| | | *Days.* | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* |
| 10837 | 7/7 | 19 | 12.11 | 8.03 | 8.10 | 65.04 | 109,200 | 109,200 | 1,678 |
| 10838 | 7/7 | 19 | 12.12 | 8.00 | 8.06 | 64.48 | 116,950 | 116,950 | 1,814 |
| 10839 | 7/7 | 19 | 12.07 | 8.04 | 8.06 | 64.96 | 118,400 | 118,400 | 1,823 |
| 10840 | 7/7 | 19 | 12.08 | 8.04 | 8.05 | 64.72 | 142,800 | 144,150 | 2,227 |
| 10841 | 7/7 | 20 | 12.18 | 8.01 | 8.03 | 64.32 | 135,072 | 154,368 | 2,400 |
| 10842 | 7/7 | 20 | 12.03 | 8.02 | 8.01 | 64.24 | 147,752 | 147,752 | 2,300 |
| 10843 | 7/13 | 13 | 12.10 | 8.12 | 8.01 | 65.04 | 131,900 | 131,900 | 2,028 |
| 10844 | 7/13 | 13 | 12.11 | 8.11 | 8.03 | 65.12 | 120,600 | 120,600 | 1,852 |
| 10845 | 7/13 | 14 | 12.13 | 8.09 | 8.12 | 65.69 | 118,242 | 118,242 | 1,800 |
| 10846 | 7/13 | 14 | 11.97 | 8.16 | 8.03 | 65.52 | 123,100 | 123,100 | 1,879 |
| 10847 | 7/15 | 11 | 12.12 | 8.02 | 8.17 | 65.52 | 68,620 | 68,620 | 1,047 |
| 10848 | 7/15 | 11 | 12.15 | 8.06 | 8.11 | 65.37 | 88,200 | 95,150 | 1,456 |
| 10849 | 7/15 | 11 | 12.12 | 8.06 | 8.11 | 65.37 | 98,055 | 117,200 | 1,793 |
| 10850 | 7/15 | 12 | 12.14 | 8.10 | 8.09 | 65.53 | 98,295 | 101,900 | 1,555 |
| 10851 | 7/20 | 6 | 12.09 | 8.05 | 8.15 | 65.61 | 61,000 | 64,600 | 985 |
| 10852 | 7/20 | 6 | 12.00 | 8.05 | 8.06 | 64.88 | 62,600 | 62,600 | 965 |
| 10853 | 7/20 | 6 | 12.18 | 8.01 | 8.05 | 64.48 | 64,480 | 68,450 | 1,062 |
| 10854 | 7/20 | 6 | 12.10 | 8.02 | 8.07 | 64.72 | 71,192 | 88,700 | 1,293 |

No. 10841.

Marks, 7/7.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 20 days.
Height, 12″.18.
Sectional area, 8″.01×8″.03=64.32 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,432 | 100 | 0. | 0. | Initial load. |
| 12,864 | 200 | .0001 | 0. | |
| 19,296 | 300 | .0003 | 0. | |
| 25,728 | 400 | .0005 | .0001 | |
| 32,160 | 500 | .0006 | .0002 | |
| 38,592 | 600 | .0008 | .0002 | E=4,167,000 pounds per square inch. |
| 45,024 | 700 | .0010 | .0003 | |
| 51,456 | 800 | .0013 | .0003 | |
| 57,888 | 900 | .0015 | .0004 | |
| 64,320 | 1,000 | .0017 | .0005 | E=3,750,000 pounds per square inch. |
| 70,752 | 1,100 | .0020 | .0006 | |
| 77,184 | 1,200 | .0023 | .0007 | |
| 83,616 | 1,300 | .0026 | .0008 | |
| 90,048 | 1,400 | .0033 | .0010 | |
| 96,480 | 1,500 | .0039 | .0013 | |
| 102,912 | 1,600 | .0045 | .0016 | |
| 109,344 | 1,700 | .0053 | .0019 | |
| 115,776 | 1,800 | .0062 | .0024 | |
| 122,208 | 1,900 | .0075 | .0032 | |
| 128,640 | 2,000 | .0089 | .0040 | |
| 135,072 | 2,100 | .0110 | .0058 | First crack. |
| 141,504 | 2,200 | .0131 | .0074 | |
| 147,936 | 2,300 | .0165 | .0101 | |
| 154,368 | 2,400 | .0220 | ..... | Ultimate strength. |

No. 10842.

Marks, 7/7.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 20 days.
Height, 12″.03.
Sectional area, 8″.02×8″.01=64.24 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,424 | 100 | 0. | 0. | Initial load. |
| 12,848 | 200 | 0. | 0. | |
| 19,272 | 300 | .0001 | 0. | |
| 25,696 | 400 | .0002 | 0. | |
| 32,120 | 500 | .0002 | 0. | |
| 38,544 | 600 | .0004 | 0. | E=6,250,000 pounds per square inch. |
| 44,968 | 700 | .0006 | 0. | |
| 51,392 | 800 | .0006 | .0001 | |
| 57,816 | 900 | .0011 | .0001 | |
| 64,240 | 1,000 | .0015 | .0002 | E=3,461,000 pounds per square inch. |
| 70,664 | 1,100 | .0017 | .0008 | |
| 77,088 | 1,200 | .0021 | .0004 | |
| 83,512 | 1,300 | .0025 | .0007 | |
| 89,936 | 1,400 | .0030 | .0009 | |
| 96,360 | 1,500 | .0035 | .0011 | |
| 102,784 | 1,600 | .0039 | .0013 | |
| 109,208 | 1,700 | .0046 | .0016 | |
| 115,632 | 1,800 | .0055 | .0022 | |
| 122,056 | 1,900 | .0064 | .0025 | |
| 128,480 | 2,000 | .0078 | .0036 | |
| 134,904 | 2,100 | .0090 | .0044 | |
| 141,328 | 2,200 | .0110 | .0057 | |
| 147,752 | 2,300 | ..... | ..... | Ultimate strength. |

## No. 10845.

Marks, 7/13.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 14 days.
Height, 12″.13.
Sectional area, 8″.09×8″.12=65.69 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,569 | 100 | 0. | 0. | Initial load. |
| 13,138 | 200 | 0. | 0. | |
| 19,707 | 300 | 0. | 0. | |
| 26,276 | 400 | .0001 | 0. | |
| 32,845 | 500 | .0002 | 0. | |
| 39,414 | 600 | .0004 | 0. | E=6,250,000 pounds per square inch. |
| 45,983 | 700 | .0006 | 0. | |
| 52,552 | 800 | .0008 | 0. | |
| 59,121 | 900 | .0011 | 0. | |
| 65,690 | 1,000 | .0014 | .0001 | E=3,461,000 pounds per square inch. |
| 72,259 | 1,100 | .0018 | .0002 | |
| 78,828 | 1,200 | .0022 | .0004 | |
| 85,397 | 1,300 | .0027 | .0006 | |
| 91,966 | 1,400 | .0033 | .0009 | |
| 98,535 | 1,500 | .0041 | .0012 | |
| 105,104 | 1,600 | .0050 | .0017 | |
| 111,673 | 1,700 | .0069 | .0030 | |
| 118,242 | 1,800 | .0170 | ..... | Ultimate strength. |

## No. 10846

Marks, 7/13.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 14 days.
Height, 11″.97.
Sectional area, 8″.16×8″.03=65.52 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,552 | 100 | 0. | 0. | Initial load. |
| 13,104 | 200 | 0. | 0. | |
| 19,656 | 300 | .0002 | 0. | |
| 26,208 | 400 | .0004 | 0. | |
| 32,760 | 500 | .0006 | 0. | |
| 39,312 | 600 | .0008 | .0001 | E=3,571,000 pounds per square inch. |
| 45,864 | 700 | .0010 | .0002 | |
| 52,416 | 800 | .0014 | .0003 | |
| 58,968 | 900 | .0017 | .0005 | |
| 65,520 | 1,000 | .0022 | .0007 | E=3,000,000 pounds per square inch. |
| 72,072 | 1,100 | .0029 | .0010 | |
| 78,624 | 1,200 | .0034 | .0013 | |
| 85,176 | 1,300 | .0043 | .0018 | |
| 91,728 | 1,400 | .0053 | .0024 | |
| 98,280 | 1,500 | .0067 | .0032 | |
| 104,832 | 1,600 | .0086 | .0045 | |
| 111,384 | 1,700 | .0105 | .0059 | |
| 117,936 | 1,800 | .0135 | .0082 | |
| 123,100 | 1,879 | ..... | ..... | Ultimate strength. |

## No. 10849.

Marks, 7/15.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 11 days.
Height, 12″.12.
Sectional area, 8″.06×8″.11=65.37 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,537 | 100 | 0. | 0. | Initial load. |
| 13,074 | 200 | .0001 | 0. | |
| 19,611 | 300 | .0002 | 0. | |
| 26,148 | 400 | .0003 | .0001 | |
| 32,685 | 500 | .0005 | .0001 | |
| 39,222 | 600 | .0007 | .0002 | E=5,000,000 pounds per square inch. |
| 45,759 | 700 | .0011 | .0003 | |
| 52,296 | 800 | .0015 | .0005 | |
| 58,833 | 900 | .0020 | .0008 | |
| 65,370 | 1,000 | .0030 | .0014 | E=2,812,000 pounds per square inch. |
| 71,907 | 1,100 | .0041 | .0022 | |
| 78,444 | 1,200 | .0058 | .0033 | |
| 84,981 | 1,300 | .0080 | .0048 | |
| 91,518 | 1,400 | .0097 | .0062 | |
| 98,055 | 1,500 | .0120 | .0081 | First crack. |
| 117,200 | 1,798 | ..... | ..... | Ultimate strength. |

## No. 10,850.

Marks, 7/15.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 12 days.
Height, 12″.14.
Sectional area, 8″.10×8″.09=65.53 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,553 | 100 | 0. | 0. | Initial load. |
| 13,106 | 200 | .0001 | 0. | |
| 19,659 | 300 | .0002 | 0. | |
| 26,212 | 400 | .0003 | 0. | |
| 32,765 | 500 | .0004 | 0. | |
| 39,318 | 600 | .0006 | .0001 | E=5,000,000 pounds per square inch. |
| 45,871 | 700 | .0008 | .0001 | |
| 52,424 | 800 | .0010 | .0001 | |
| 58,977 | 900 | .0012 | .0001 | |
| 65,530 | 1,000 | .0014 | .0001 | E=3,461,000 pounds per square inch. |
| 72,083 | 1,100 | .0016 | .0002 | |
| 78,636 | 1,200 | .0018 | .0002 | |
| 85,189 | 1,300 | .0023 | .0002 | |
| 91,742 | 1,400 | .0032 | .0003 | |
| 98,295 | 1,500 | .0045 | .0009 | First crack. |
| 101,900 | 1,555 | ..... | ..... | Ultimate strength. |

## No. 10,853.

Marks, 7/20.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 6 days.
Height, 12″.18.
Sectional area, 8″.01×8″.05=64.48 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,448 | 100 | 0. | 0. | Initial load. |
| 12,896 | 200 | 0. | 0. | |
| 19,344 | 300 | .0001 | 0. | |
| 25,792 | 400 | .0002 | 0. | |
| 32,240 | 500 | .0006 | 0. | |
| 38,688 | 600 | .0013 | .0008 | E=2,500,000 pounds per square inch. |
| 45,136 | 700 | .0019 | .0006 | |
| 51,584 | 800 | .0032 | .0013 | |
| 58,032 | 900 | .0058 | .0026 | |
| 64,480 | 1,000 | .0094 | .0091 | First crack. |
| 68,450 | 1,062 | ..... | ..... | Ultimate strength. |

## No. 10,854.

Marks, 7/20.
Composition: Alsen cement, 1; sand, 2; broken stone, 4.
Age, 6 days.
Height, 12″.10.
Sectional area, 8″.02×8″.07=64.72 square inches.
Gauged length, 5″.

| Applied loads. | | In gauged length. | | Remarks. |
|---|---|---|---|---|
| Total. | Per square inch. | Compression. | Set. | |
| *Pounds.* | *Pounds.* | *Inch.* | *Inch.* | |
| 6,472 | 100 | 0. | 0. | Initial load. |
| 12,944 | 200 | 0. | 0. | |
| 19,416 | 300 | .0001 | 0. | |
| 25,888 | 400 | .0008 | 0. | |
| 32,360 | 500 | .0006 | .0001 | |
| 38,832 | 600 | .0009 | .0001 | E=3,125,000 pounds per square inch. |
| 45,304 | 700 | .0015 | .0004 | |
| 51,776 | 800 | .0023 | .0009 | |
| 58,248 | 900 | .0033 | .0015 | |
| 64,720 | 1,000 | .0049 | .0025 | E=1,875,000 pounds per square inch. |
| 71,192 | 1,100 | .0076 | .0043 | First crack. |
| 77,664 | 1,200 | .0106 | .0068 | |
| 83,700 | 1,293 | ..... | ..... | Ultimate strength. |

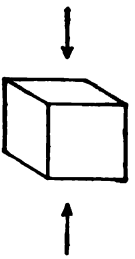
# "YAMMERTHAL FLINT" LIMESTONE

FROM

## BUFFALO, NEW YORK.

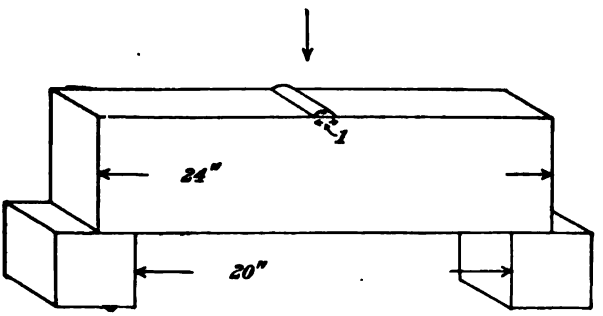
847

## Compression Tests.



| No. of test. | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | |
|---|---|---|---|---|---|---|---|
| | Height. | Compressed surface. | | | | Total. | Per square inch. |
| | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* |
| 10265 | 4.06 | 4.05 | 4.05 | 16.40 | 361,000 | 474,800 | 28,951 |
| 10266 | 4.08 | 4.05 | 4.04 | 16.36 | 178,000 | 302,600 | 18,496 |

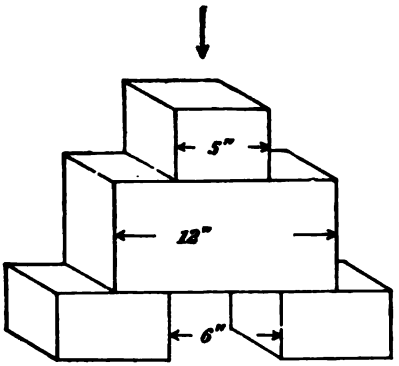
## Transverse Tests.




Stones supported at ends 20" apart and loaded at the middle over a length of 1".

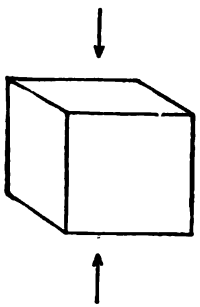
| No. of test. | Dimensions. | | Ultimate strength. | |
|---|---|---|---|---|
| | Breadth. | Depth. | Total. | Modulus of rupture, R. |
| | *Inches.* | *Inches.* | *Pounds.* | *Pounds.* |
| 10261 | 4.04 | 6.04 | 6,760 | 1,376 |
| 10262 | 4.09 | 6.06 | 10,010 | 2,000 |

## Shearing Tests.




| No. of test. | Shearing dimensions. | Shearing area. | Shearing strength. | |
|---|---|---|---|---|
| | | | Total. | Per square inch. |
| | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* |
| 10263 | 4.06×6.04×2 | 49.04 | 123,500 | 2,518 |
| 10264 | 4.04×6.05×2 | 48.88 | 84,800 | 1,735 |

## Compression Test of Red Granite.



Sample sawed out of a larger block and faces rubbed flat.

| No. of test. | Dimensions. | | | Sectional area. | First crack. | Ultimate strength. | |
|---|---|---|---|---|---|---|---|
| | Height. | Compressed surface. | | | | Total. | Per square inch. |
| | *Inches.* | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Pounds.* |
| 9522 | 4.03 | 4.00 | 4.01 | 16.04 | 444,000 | 459,500 | 28,647 |

Pyramidal fracture.

# Cement Briquettes.

## BEACH'S ROSENDALE CEMENT.

### BRIQUETTES SET IN AIR 24 HOURS.

| No. of test. | Marks. | Dimensions. | | Sectional area. | Tensile strength. | | Fineness. | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Residue on sieves. | |
| | | Width. | Thickness. | | Total. | Per square inch. | 80-mesh. | 100-mesh. |
| | | *Inches.* | *Inches.* | *Sq. inches.* | *Pounds.* | *Pounds.* | *Per cent.* | *Per cent.* |
| 9548 | 1 | 1.01 | 1.00 | 1.01 | 119 | 118 | 12.0 | 12.5 |
| | | 1.01 | 1.02 | 1.03 | 155 | 151 | | |
| | | 1.02 | 1.01 | 1.03 | 120 | 116 | | |
| 9549 | 2 | 1.02 | 1.00 | 1.02 | 129 | 126 | 19.1 | 19.1 |
| | | 1.02 | 1.00 | 1.02 | 92 | 90 | | |
| | | 1.02 | 1.00 | 1.02 | 120 | 118 | | |
| 9550 | 3 | 1.02 | 1.00 | 1.02 | 130 | 127 | 18.7 | 18.8 |
| | | 1.01 | 1.01 | 1.02 | 126 | 124 | | |
| | | 1.02 | 1.00 | 1.02 | 116 | 114 | | |
| 9551 | 4 | 1.02 | 1.00 | 1.02 | 137 | 134 | 16.5 | 17.0 |
| | | 1.02 | 1.00 | 1.02 | 109 | 107 | | |
| | | 1.02 | 1.00 | 1.02 | 115 | 113 | | |
| 9552 | 5 | 1.02 | 1.00 | 1.02 | 145 | 142 | 10.5 | 11.9 |
| | | 1.02 | 1.00 | 1.02 | 158 | 155 | | |
| | | 1.02 | 1.00 | 1.02 | 148 | 145 | | |
| 9553 | 6 | 1.02 | 1.00 | 1.02 | 97 | 95 | 16.2 | 17.0 |
| | | 1.02 | 1.00 | 1.02 | 70 | 69 | | |
| | | 1.02 | 1.00 | 1.02 | 85 | 83 | | |
| 9554 | 7 | 1.02 | 1.01 | 1.03 | 86 | 83 | 19.5 | 20.0 |
| | | 1.02 | 1.01 | 1.03 | 128 | 124 | | |
| | | 1.01 | 1.01 | 1.02 | 136 | 133 | | |
| 9555 | 8 | 1.02 | .98 | 1.00 | 124 | 124 | 18.5 | 18.7 |
| | | 1.02 | 1.00 | 1.02 | 138 | 135 | | |
| | | 1.02 | 1.00 | 1.02 | 154 | 151 | | |
| 9556 | 9 | 1.01 | 1.00 | 1.01 | 98 | 97 | 11.0 | 12.0 |
| | | 1.02 | 1.00 | 1.02 | 146 | 143 | | |
| | | 1.01 | .99 | 1.00 | 152 | 152 | | |
| 9557 | 10 | 1.02 | 1.00 | 1.02 | 156 | 152 | 14.5 | 15.4 |
| | | 1.02 | 1.00 | 1.02 | 141 | 138 | | |
| | | 1.01 | 1.00 | 1.01 | 174 | 172 | | |
| 9558 | 11 | 1.02 | 1.01 | 1.03 | 128 | 124 | 20.5 | 20.8 |
| | | 1.02 | 1.00 | 1.02 | 121 | 119 | | |
| | | 1.02 | 1.00 | 1.02 | 137 | 134 | | |
| 9559 | 12 | 1.02 | 1.00 | 1.02 | 150 | 147 | 16.0 | 16.5 |
| | | 1.02 | .98 | 1.00 | 155 | 155 | | |
| | | 1.02 | 1.00 | 1.02 | 142 | 139 | | |
| 9560 | 13 | 1.01 | 1.01 | 1.02 | 154 | 152 | 21.0 | 21.5 |
| | | 1.01 | 1.00 | 1.01 | 151 | 149 | | |
| | | 1.02 | 1.00 | 1.02 | 132 | 129 | | |

### BRIQUETTES SET IN AIR 2 HOURS, AND IN WATER 22 HOURS.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 9563 | 1 | 1.00 | .98 | .98 | 70 | 71 | ..... | ..... |
| 9564 | 2 | 1.01 | .98 | .99 | 79 | 80 | ..... | ..... |
| 9565 | 3 | 1.01 | 1.00 | 1.01 | 73 | 72 | ..... | ..... |
| 9566 | 4 | 1.01 | .99 | 1.00 | 73 | 73 | ..... | ..... |
| 9567 | 6 | 1.01 | 1.00 | 1.01 | 63 | 62 | ..... | ..... |
| 9568 | 8 | 1.01 | .99 | 1.00 | 79 | 79 | ..... | ..... |
| 9569 | 9 | 1.01 | 1.00 | 1.01 | 63 | 62 | ..... | ..... |
| 9570 | 10 | 1.02 | 1.00 | 1.02 | 62 | 61 | ..... | ..... |
| 9571 | 11 | 1.02 | 1.00 | 1.02 | 66 | 65 | ..... | ..... |
| 9572 | 12 | 1.02 | 1.00 | 1.02 | 79 | 77 | ..... | ..... |

# ENDURANCE OF ROTATING SHAFTS.

Shafts turned down from bars $1\frac{1}{4}$" diameter.
Diameter 1". Speed of rotation, 500 per minute.
Length between end supports, 33".
Loaded over 4" length at middle.

| No. of test. | Marks. | Carbon. | Maximum fiber stress per square inch. | Total number of rotations. | Treatment of steel. | Remarks. |
|---|---|---|---|---|---|---|
| 304 | 1–C–2 | 0.161 | 40,000 | 452,700 | Untreated, hot rolled bar. | Ruptured. |
| 307 | 2–C–2 | 0.172 | 40,000 | 366,500 | .....do..... | Do. |
| 306 | 3–C–2 | 0.341 | 40,000 | 535,200 | .....do..... | Do. |
| 309 | 7–B–1 | 0.733 | 40,000 | 56,518,910 | .....do..... | Not ruptured. |
| 310 | 9–C–2 | 0.824 | 40,000 | 65,679,000 | .....do..... | Do. |
| 308 | 11–C–3 | 1.094 | 40,000 | 50,214,720 | .....do..... | Do. |
| 311 | .7×1 / 1 | 0.26 | 40,000 | 27,546,930 | Annealed at low heat.... | Ruptured. |
| 317 | 7×1 / 7 | 0.26 | 40,000 | 36,502,480 | Oil tempered and annealed at high heat. | Not ruptured. |

# IMPACT TESTS.

## IMPACT TESTS.

Impact tests were inaugurated upon the softer metals under compression loads, using flat-ended cylindrical specimens. They rested upon an anvil having a hardened steel face, and were struck by blows from a falling ram of 77 pounds weight, which also had a hardened steel hammer face.

The anvil and cast-iron chabotte, which are securely bolted together, have a total weight of about 30,000 pounds, and these rest upon a cast-iron base, which in turn weighs about 30,000 pounds.

Results on lead form the larger part of the experiments here reported, a number of tests having been made upon tin, zinc, and copper; all subjected to impact under striking velocities ranging from 1.64 feet per second for a drop of $\frac{1}{2}''$ up to 19.79 feet per second for a drop of 73".

The details of the experiments are followed by a number of diagrams showing certain series of the tests.

Rod lead was generally used on account of its uniformity in structure and resisting qualities. This metal was cast in a cylinder $7\frac{5}{16}''$ diameter and forced through an aperture at the lower end, the size of the rod, by means of a plunger actuated by hydraulic pressure, in the usual manner of making lead pipe. The coarser granular structure found in the casting in this manner is drawn down to a finer granulation, much elongated, in the rod, and possessing greater uniformity in resistance than found in small castings, in which different casting temperatures and conditions of cooling are usually experienced.

Table 1 gives the results in a series of 73 specimens, 1" diameter and 2" in height each, which were subjected to one blow each of the ram, the heights ranging from 1" to 73". This was followed by giving each specimen an additional blow of 5" drop, and afterwards a blow from such additional height as gave an aggregate of 79" for the three blows.

Table 2 gives results on specimens 1" diameter and $1\frac{1}{2}''$ in height;

Table 3, results on specimens of the same diameter but 1" in height; and

Table 4, specimens 0.799" diameter by 1".6 in height.

In Table 5 are the results on one specimen subjected to successive blows 1" each, aggregating 73" in the series.

Table 6 shows similarly the results on one specimen in which each blow was from a height of 2", while

Table 7 has the results of six different specimens, which were subjected to blows of 6" each, and from greater heights.

Tables 9 and 10 are on individual specimens, cylinders 1" diameter by $1\frac{1}{2}''$ high, and 0".799 diameter by 1".6 high respectively. On Table 10 are shown results in which intervals of rest have occurred between blows.

The results on samples taken directly from the pig are found in Table 11.

Diagrams 1, 2, and 3 are based upon the results found in tables 1, 2, 3, 5, 6, and 7.

The relative compression of cylinders of the same diameter, but of different heights, may be seen upon inspection of diagram 1.

In diagram 2 are shown the curves resulting from the first series of

single blows, additional blows of 5″ each, and after an aggregate of 79″ in height had been received by each specimen. The increased resistance of the metal against higher striking velocities of the ram is clearly shown by comparing the relative effect of the 5″ blows with the curve of single blows for greater heights. The curve after 79″ aggregate drop further shows the same result, and since the halves of this curve are fairly alike it appears that about the same result is reached when the order of the blows was 1″, 5″, and 73″, or when this order was reversed.

More conspicuous still are the results plotted in diagram 3 of the relative resistance of the lead under different striking velocities of the ram. Comparing, as an example, the effect of three blows of 12″ each with the corresponding decrement of the specimen under a single blow and it will be found to correspond with a single blow of 53″. This difference in resistance is evidently encountered in the early stages of compression, when the metal is being displaced at the higher velocities, and is an index of the resistance encountered in the single blow having a maximum velocity of 16.86 feet per second against a maximum velocity of 8.02 feet per second in the 12″ blows. In the latter stages of compression, with the velocity of the ram greatly retarded, the resistance of the metal against flow approaches a condition more nearly identical in each experiment.

The curves of decrements of heights under the lower striking velocities of the 6″, 2″, and 1″ blows show less variation in the resistance of the metal. A series of ½″ blows, the details of which are not recorded in this report, shows somewhat less resistance encountered than with 1″ blows; that is, the decrements in heights are greater in the case of the ½″ blows for equal aggregate blows. From all of which it appears that the resistance of flow increases with the increase of velocity of impact over the range of velocities covered by these experiments.

At the foot of Table 7 are the measurements of concentric circles on the ends of a specimen and the distance apart of rings on the cylindrical surface laid off before impact and measured again after impact. This was done to judge of the paths followed by the parts of the specimen during impact. The enlargement of each of the end circles indicates the projection of metal into these surfaces from points below, and the shortened surface sections show that some folding over occurred near the circumference. From the sinuous shape assumed by these circular lines after impact, it was evident that flow did not take place uniformly throughout the mass, but was modified by the crystalline structure of the lead. As the specimens were reduced in height, there was formed a bright halo of metal on the ends at the circumference, reaching a width of 0″.2 ±, and which was attributed to radial flow of the lead over the surfaces of the anvil and the hammer face of the ram. This frictional resistance must necessarily absorb some of the energy of the falling weight. Still, a succession of short blows caused the specimen to assume a more decided barrel shape than a single blow from a height equal to the aggregate of the shorter ones.

In those experiments in which single blows of gradually increasing heights were used, the different specimens gradually assumed a truncated conoidal shape, in which the larger diameter was at the bottom end, that resting upon the anvil. These remarks all refer to the behavior of the lead cylinders.

In carrying out experiments where a number of blows were given the same specimen, some irregularity in the behavior of the lead was due to intervals of rest occurring during the progress of the series. Special tests on this feature are recorded in Table 10. In the second experiment it will be seen that the blows immediately followed each other until four had been delivered, the successive decrements in height, which began with 0″.059, falling in the meantime to 0″.031. Then followed an interval of rest of 22 hours, after which the next decrement of height rose to 0″.050, and was followed by decrements of 0″.035 and 0″.030 under the additional blows immediately thereafter given. Another rest followed, now of 30 hours, whereupon the decrement of height was 0″.054. Not in all cases were the differences in the magnitude of the decrements so marked as these referred to, the rest following the ninth blow forming an exception in the present experiment.

It will be further observed that when rests followed each sucessive blow the decrements of height did not attain the magnitude found in those cases in which several blows preceded the interval of rest. The first experiment in the table shows this.

A statement consistent with the present data would be as follows: That lead may be brought into a temporary state of higher resistance, and that during an interval of rest this temporary state of increased rigidity may be recovered from. This state of increased rigidity must, of course, first be entered upon to admit of subsequent relaxation.

In the preliminary tests of lead cylinders from metals cast under different rates of cooling it appeared that the more slowly cooled samples gave somewhat less resistance to impact than rapidly cooled metal. The slowly cooled samples were much the coarser grained.

Specimens from the pig, when compressed normally to the longitudinal axes of the crystals of the metal, flowed most in the direction of the length of the crystals. Specimen H, Table 11, after a drop of 60″, elongated in the direction of the length of the crystals from 1′ (the original diameter) to 2″.09 after impact, while in a crosswise direction the final diameter was 1″.07, an increase of 0″.07 in this direction against 1″.09 in the direction of the lengths of the crystals.

This tendency to flow more readily in the direction of the major axes of the crystals may be overcome in a degree by a partial compression under a lighter blow followed by an interval of rest.

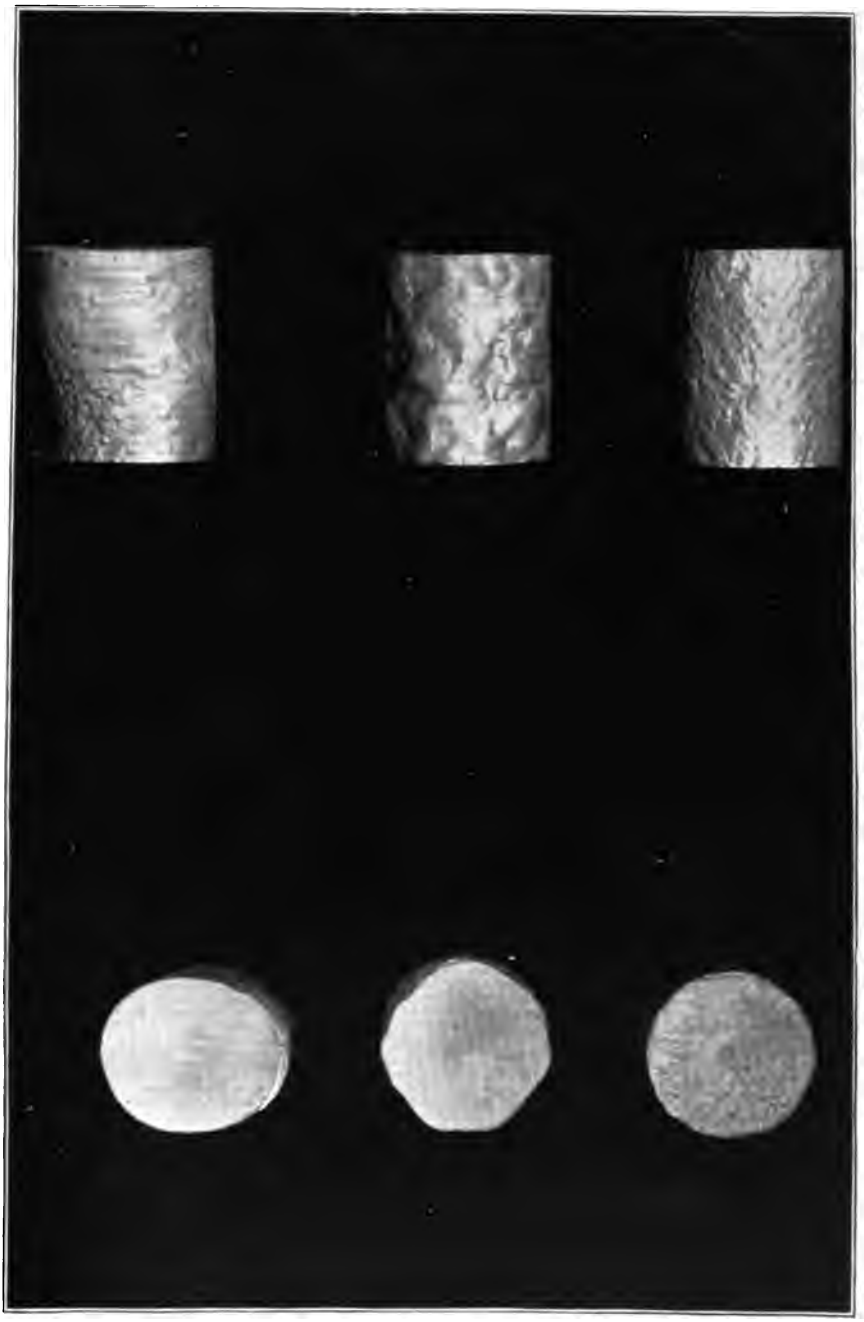
Specimen I was first struck with a blow of 30″ height, and then after four days' rest with another of the same height. After the first blow the major and minor diameters were 1″.54 and 1″.06, respectively; after the second they were 1″.80 and 1″.30, a decided gain in the crosswise direction of the crystals by the second blow. Specimens compressed endwise the crystals more readily retain their cylindrical shape. Specimen C, after a blow of 60″, measured 1″.5 and 1″.3 on two diameters.

Notwithstanding these peculiarities of flow, the decrements of height are not decidedly unlike, whether the specimens are compressed longitudinally or radially with reference to the location of the specimen in the pig.

Coming to the behavior of tin, shown in Table 12, the decrements of height are greater with specimens compressed endwise the crystals.

Radial specimen 17, under 50″ height of drop, compressed 0″.455 against 0″.355 for specimen 5, which was taken out of the ingot in a longitudinal direction. The photographs show the radial specimens to have their axes parallel to the length of the crystals of the metal.

Tin and zinc both differ from lead in respect to the direction in which lateral flow most readily takes place. In these metals the greater flow takes place perpendicular to the longitudinal axes of the crystals. Tin recast from the ingot in an iron mold gives greater resistance against impact than specimens from the ingot.



1 2 3

APPEARANCE OF LEAD SPECIMENS AFTER IMPACT.

1. Specimen from the pig.
2. Specimen from a casting in a magnesia mold.
3. Specimen from a casting in an iron mold.

## Impact Tests. Lead Cylinders.

**Lead rod from the Boston Lead Manufacturing Company.**
**Weight of ram, 77 pounds.**

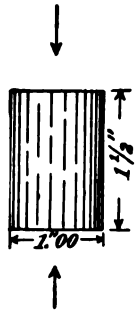
| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | | Height of drop, second blow. | Height of specimen after impact. | Decrement of height. | Height of drop, third blow. | Height of specimen after impact. | Decrement of height. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. | | | | | | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* |
| 1 | 2.000 | 1.942 | 1.02 | 0.058 | 0.058 | 5 | 1.780 | 0.162 | 73 | 0.864 | 0.916 | 1.136 |
| 2 | 1.999 | 1.902 | 1.08 | .097 | .039 | 5 | 1.752 | .150 | 72 | .858 | .894 | 1.141 |
| 3 | 2.000 | 1.869 | 1.04 | .131 | .034 | 5 | 1.727 | .142 | 71 | .855 | .872 | 1.145 |
| 4 | 1.999 | 1.840 | 1.04 | .159 | .028 | 5 | 1.688 | .152 | 70 | .842 | .846 | 1.157 |
| 5 | 1.999 | 1.812 | 1.05 | .187 | .029 | 5 | 1.649 | .163 | 69 | .830 | .819 | 1.169 |
| 6 | 1.999 | 1.787 | 1.06 | .212 | .025 | 5 | 1.620 | .167 | 68 | .827 | .793 | 1.172 |
| 7 | 1.999 | 1.768 | 1.06 | .236 | .024 | 5 | 1.597 | .166 | 67 | .819 | .778 | 1.180 |

## IMPACT TESTS. LEAD CYLINDERS—Continued.

| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | | Height of drop, second blow. | Height of specimen after impact. | Decrement of height. | Height of drop, third blow. | Height of specimen after impact. | Decrement of height. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. | | | | | | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* |
| 8 | 1.999 | 1.741 | 1.07 | .258 | .022 | 5 | 1.575 | .166 | 66 | .820 | .755 | 1.179 |
| 9 | 1.999 | 1.718 | 1.08 | .281 | .023 | 5 | 1.554 | .164 | 65 | .813 | .741 | 1.186 |
| 10 | 1.999 | 1.697 | 1.09 | .302 | .021 | 5 | 1.535 | .162 | 64 | .811 | .724 | 1.188 |
| 11 | 1.999 | 1.679 | 1.10 | .320 | .018 | 5 | 1.518 | .161 | 63 | .807 | .711 | 1.192 |
| 12 | 1.999 | 1.660 | 1.10 | .339 | .019 | 5 | 1.501 | .159 | 62 | .806 | .695 | 1.193 |
| 13 | 1.999 | 1.641 | 1.11 | .358 | .019 | 5 | 1.484 | .157 | 61 | .804 | .680 | 1.196 |
| 14 | 1.999 | 1.622 | 1.12 | .377 | .019 | 5 | 1.466 | .156 | 60 | .802 | .664 | 1.197 |
| 15 | 1.999 | 1.605 | 1.12 | .394 | .017 | 5 | 1.452 | .153 | 59 | .799 | .653 | 1.200 |
| 16 | 1.999 | 1.587 | 1.13 | .412 | .018 | 5 | 1.435 | .152 | 58 | .799 | .636 | 1.200 |
| 17 | 1.998 | 1.570 | 1.13 | .428 | .016 | 5 | 1.420 | .150 | 57 | .797 | .623 | 1.201 |
| 18 | 1.998 | 1.554 | 1.14 | .444 | .016 | 5 | 1.406 | .148 | 56 | .796 | .610 | 1.201 |
| 19 | 1.998 | 1.539 | 1.14 | .459 | .015 | 5 | 1.393 | .146 | 55 | .796 | .598 | 1.203 |
| 20 | 1.999 | 1.522 | 1.15 | .477 | .018 | 5 | 1.377 | .145 | 54 | .792 | .585 | 1.207 |
| 21 | 1.999 | 1.507 | 1.16 | .492 | .015 | 5 | 1.364 | .143 | 53 | .789 | .575 | 1.210 |
| 22 | 1.999 | 1.493 | 1.17 | .506 | .014 | 5 | 1.352 | .141 | 52 | .790 | .562 | 1.209 |
| 23 | 1.999 | 1.476 | 1.17 | .523 | .017 | 5 | 1.338 | .138 | 51 | .786 | .552 | 1.213 |
| 24 | 1.999 | 1.463 | 1.18 | .536 | .013 | 5 | 1.326 | .137 | 50 | .788 | .538 | 1.211 |
| 25 | 1.999 | 1.452 | 1.18 | .547 | .011 | 5 | 1.316 | .136 | 49 | .789 | .527 | 1.210 |
| 26 | 1.999 | 1.438 | 1.19 | .561 | .014 | 5 | 1.303 | .135 | 48 | .787 | .516 | 1.212 |
| 27 | 1.999 | 1.424 | 1.19 | .575 | .014 | 5 | 1.291 | .133 | 47 | .786 | .505 | 1.213 |
| 28 | 1.999 | 1.409 | 1.20 | .590 | .015 | 5 | 1.279 | .130 | 46 | .783 | .496 | 1.216 |
| 29 | 1.998 | 1.400 | 1.21 | .598 | .008 | 5 | 1.269 | .131 | 45 | .785 | .484 | 1.213 |
| 30 | 1.998 | 1.382 | 1.21 | .616 | .018 | 5 | 1.254 | .128 | 44 | .783 | .471 | 1.215 |
| 31 | 1.999 | 1.371 | 1.22 | .628 | .012 | 5 | 1.243 | .128 | 43 | .782 | .461 | 1.217 |
| 32 | 1.999 | 1.357 | 1.23 | .642 | .014 | 5 | 1.229 | .128 | 42 | .776 | .458 | 1.223 |
| 33 | 1.99[illegible] | 1.346 | 1.23 | .653 | .011 | 5 | 1.220 | .126 | 41 | .779 | .441 | 1.220 |
| 34 | 1.99[illegible] | 1.330 | 1.24 | .666 | .013 | 5 | 1.206 | .124 | 40 | .778 | .428 | 1.218 |
| 35 | 1.999 | 1.324 | 1.25 | .675 | .009 | 5 | 1.201 | .123 | 39 | .782 | .419 | 1.217 |
| 36 | 1.999 | 1.311 | 1.25 | .688 | .013 | 5 | 1.189 | .122 | 38 | .781 | .406 | 1.218 |
| 37 | 1.998 | 1.301 | 1.26 | .697 | .009 | 5 | 1.181 | .120 | 37 | .782 | .399 | 1.216 |
| 38 | 1.999 | 1.291 | 1.26 | .708 | .011 | 5 | 1.171 | .120 | 36 | .783 | .388 | 1.216 |
| 39 | 2.001 | 1.277 | 1.27 | .724 | .016 | 5 | 1.159 | .118 | 35 | .780 | .379 | 1.221 |
| 40 | 1.998 | 1.265 | 1.28 | .733 | .009 | 5 | 1.149 | .116 | 34 | .779 | .370 | 1.219 |
| 41 | 1.999 | 1.257 | 1.28 | .742 | .009 | 5 | 1.141 | .116 | 33 | .779 | .362 | 1.220 |
| 42 | 2.000 | 1.246 | 1.29 | .754 | .012 | 5 | 1.130 | .116 | 32 | .782 | .348 | 1.218 |
| 43 | 1.999 | 1.235 | 1.29 | .764 | .010 | 5 | 1.122 | .118 | 31 | .782 | .340 | 1.217 |
| 44 | 1.999 | 1.229 | 1.30 | .770 | .006 | 5 | 1.116 | .113 | 30 | .784 | .332 | 1.215 |
| 45 | 1.999 | 1.213 | 1.30 | .786 | .016 | 5 | 1.102 | .111 | 29 | .780 | .322 | 1.219 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 1.999 | 1.208 | 1.81 | .791 | .005 | 5 | 1.099 | .109 | 28 | .787 | .812 | 1.212 |
| 47 | 1.999 | 1.193 | 1.81 | .806 | .015 | 5 | 1.083 | .110 | 27 | .782 | .801 | 1.217 |
| 48 | 2.000 | 1.185 | 1.82 | .815 | .009 | 6 | 1.077 | .106 | 26 | .784 | .288 | 1.216 |
| 49 | 1.999 | 1.175 | 1.83 | .824 | .009 | 6 | 1.068 | .107 | 25 | .785 | .288 | 1.214 |
| 50 | 2.000 | 1.168 | 1.83 | .832 | .008 | 5 | 1.062 | .106 | 24 | .787 | .276 | 1.213 |
| 51 | 2.000 | 1.161 | 1.84 | .839 | .007 | 5 | 1.056 | .106 | 23 | .791 | .264 | 1.209 |
| 52 | 1.999 | 1.150 | 1.85 | .849 | .010 | 5 | 1.045 | .105 | 22 | .790 | .255 | 1.209 |
| 53 | 2.000 | 1.140 | 1.85 | .860 | .011 | 5 | 1.035 | .104 | 21 | .792 | .244 | 1.208 |
| 54 | 2.000 | 1.129 | 1.86 | .871 | .011 | 5 | 1.026 | .103 | 20 | .791 | .235 | 1.209 |
| 55 | 1.998 | 1.123 | 1.87 | .875 | .004 | 5 | 1.022 | .101 | 19 | .790 | .227 | 1.208 |
| 56 | 2.000 | 1.114 | 1.87 | .886 | .011 | 5 | 1.013 | .101 | 18 | .797 | .216 | 1.208 |
| 57 | 1.999 | 1.102 | 1.87 | .897 | .011 | 5 | 1.002 | .100 | 17 | .796 | .206 | 1.208 |
| 58 | 2.000 | 1.093 | 1.88 | .907 | .010 | 5 | .996 | .097 | 16 | .799 | .197 | 1.201 |
| 59 | 1.999 | 1.086 | 1.88 | .913 | .006 | 5 | .989 | .097 | 15 | .802 | .187 | 1.197 |
| 60 | 2.000 | 1.084 | 1.89 | .916 | .003 | 5 | .987 | .097 | 14 | .805 | .179 | 1.192 |
| 61 | 2.000 | 1.072 | 1.89 | .928 | .012 | 5 | .976 | .096 | 13 | .807 | .169 | 1.198 |
| 62 | 1.999 | 1.061 | 1.90 | .938 | .010 | 5 | .966 | .096 | 12 | .808 | .158 | 1.191 |
| 63 | 1.998 | 1.052 | 1.91 | .946 | .008 | 5 | .958 | .094 | 11 | .811 | .147 | 1.187 |
| 64 | 1.999 | 1.046 | 1.91 | .953 | .007 | 5 | .952 | .094 | 10 | .814 | .138 | 1.185 |
| 65 | 2.000 | 1.038 | 1.92 | .962 | .009 | 5 | .946 | .092 | 9 | .818 | .128 | 1.182 |
| 66 | 1.999 | 1.028 | 1.92 | .971 | .009 | 5 | .936 | .092 | 8 | .820 | .116 | 1.179 |
| 67 | 1.999 | 1.021 | 1.93 | .978 | .007 | 5 | .930 | .091 | 7 | .825 | .105 | 1.174 |
| 68 | 1.999 | 1.017 | 1.93 | .982 | .004 | 5 | .927 | .090 | 6 | .832 | .096 | 1.167 |
| 69 | 2.000 | 1.007 | 1.94 | .993 | .011 | 5 | .918 | .089 | 5 | .834 | .084 | 1.166 |
| 70 | 1.998 | .996 | 1.95 | 1.004 | .011 | 5 | .906 | .089 | 4 | .836 | .071 | 1.164 |
| 71 | 1.999 | .990 | 1.96 | 1.009 | .005 | 5 | .902 | .088 | 3 | .844 | .058 | 1.155 |
| 72 | 1.999 | .984 | 1.96 | 1.015 | .006 | 5 | .896 | .088 | 2 | .858 | .043 | 1.146 |
| 73 | 2.000 | .977 | 1.97 | 1.023 | .008 | 5 | .890 | .087 | 1 | .864 | .026 | 1.136 |

## IMPACT TESTS. LEAD CYLINDERS.




Lead rod from Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | | Height of drop, second blow. | Height of specimen after impact. | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. | | | Successive. | Total. | |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | |
| 1 | 1.497 | 1.444 | 1.02 | .058 | .058 | 5 | 1.298 | .146 | .199 | |
| 2 | 1.497 | 1.408 | 1.08 | .089 | .086 | 5 | 1.273 | .135 | .224 | |
| 3 | 1.498 | 1.377 | 1.04 | .121 | .082 | 5 | 1.226 | .151 | .272 | |
| 4 | 1.496 | 1.349 | 1.05 | .147 | .026 | 5 | 1.194 | .155 | .302 | |
| 5 | 1.495 | 1.324 | 1.06 | .171 | .024 | 5 | 1.169 | .155 | .326 | |
| 6 | 1.496 | 1.303 | 1.07 | .193 | .022 | 5 | 1.150 | .153 | .346 | |
| 7 | 1.496 | 1.283 | 1.08 | .213 | .020 | 5 | 1.133 | .150 | .363 | |
| 8 | 1.496 | 1.262 | 1.09 | .234 | .021 | 5 | 1.115 | .147 | .381 | |
| 9 | 1.497 | 1.243 | 1.10 | .254 | .020 | 5 | 1.098 | .145 | .399 | |
| 10 | 1.497 | 1.225 | 1.11 | .272 | .018 | 5 | 1.082 | .143 | .417 | |
| 11 | 1.495 | 1.207 | 1.12 | .288 | .016 | 5 | 1.067 | .140 | .428 | |
| 12 | 1.496 | 1.191 | 1.12 | .305 | .017 | 5 | 1.053 | .138 | .443 | |
| 13 | 1.495 | 1.174 | 1.13 | .321 | .016 | 5 | 1.038 | .136 | .457 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 1.495 | 1.157 | 1.14 | .338 | .017 | 5 | 1.023 | .134 | .472 | |
| 15 | 1.497 | 1.143 | 1.15 | .354 | .016 | 5 | 1.012 | .131 | .485 | |
| 16 | 1.494 | 1.125 | 1.16 | .369 | .015 | 5 | .996 | .129 | .498 | |
| 17 | 1.497 | 1.113 | 1.17 | .384 | .015 | 5 | .986 | .127 | .511 | |
| 18 | 1.497 | 1.098 | 1.17 | .399 | .015 | 5 | .972 | .126 | .525 | |
| 19 | 1.497 | 1.085 | 1.18 | .412 | .013 | 5 | .962 | .128 | .535 | |
| 20 | 1.495 | 1.070 | 1.19 | .425 | .013 | 5 | .948 | .122 | .547 | |
| 21 | 1.496 | 1.057 | 1.20 | .439 | .014 | 5 | .937 | .120 | .559 | |
| 22 | 1.497 | 1.044 | 1.21 | .453 | .014 | 5 | *.934 | .110 | .563 | * End bruised at time of this impact. |
| 23 | 1.497 | 1.032 | 1.21 | .465 | .012 | 5 | .915 | .117 | .582 | |
| 24 | 1.496 | 1.020 | 1.22 | .476 | .011 | 5 | .905 | .115 | .591 | |
| 25 | 1.496 | 1.006 | 1.23 | .490 | .014 | 5 | .893 | .113 | .608 | |
| 26 | 1.497 | .998 | 1.23 | .499 | .009 | 5 | .885 | .113 | .612 | |
| 27 | 1.494 | .983 | 1.24 | .511 | .012 | 5 | .873 | .110 | .621 | |
| 28 | 1.497 | .975 | 1.25 | .522 | .011 | 5 | .865 | .110 | .632 | |
| 29 | 1.494 | .962 | 1.26 | .532 | .010 | 5 | .854 | .108 | .640 | |
| 30 | 1.497 | .953 | 1.26 | .544 | .012 | 5 | .846 | .107 | .651 | |
| 31 | 1.497 | .942 | 1.27 | .555 | .011 | 5 | .836 | .106 | .661 | |
| 32 | 1.497 | .931 | 1.28 | .566 | .011 | 5 | .827 | .104 | .670 | |
| 33 | 1.497 | .919 | 1.29 | .578 | .012 | 5 | .817 | .102 | .680 | |
| 34 | 1.493 | .908 | 1.30 | .585 | .007 | 5 | .806 | .102 | .687 | |
| 35 | 1.495 | .897 | 1.30 | .598 | .013 | 5 | .796 | .101 | .699 | |
| 36 | 1.494 | .888 | 1.31 | .606 | .008 | 5 | .789 | .099 | .706 | |
| 37 | 1.495 | .877 | 1.32 | .618 | .012 | 5 | .779 | .098 | .716 | |
| 38 | 1.495 | .870 | 1.32 | .625 | .007 | 5 | .773 | .097 | .722 | |
| 39 | 1.495 | .858 | 1.33 | .637 | .012 | 5 | .762 | .096 | .733 | |
| 40 | 1.495 | .850 | 1.34 | .645 | .008 | 5 | .755 | .095 | .740 | |
| 41 | 1.495 | .840 | 1.35 | .655 | .010 | 5 | .747 | .093 | .748 | |
| 42 | 1.494 | .834 | 1.36 | .660 | .005 | 5 | .741 | .093 | .753 | |
| 43 | 1.497 | §.819 | 1.37 | .678 | .018 | 5 | .728 | .091 | .769 | § Irregular shape, coarse and fine granulation. |
| 44 | 1.493 | .815 | 1.37 | .678 | 0. | 5 | .726 | .089 | .767 | |
| 45 | 1.493 | .808 | 1.38 | .685 | .007 | 5 | .719 | .089 | .774 | |
| 46 | 1.494 | .800 | 1.39 | .694 | .009 | 5 | .713 | .087 | .781 | |
| 47 | 1.497 | .794 | 1.39 | .703 | .009 | 5 | .706 | .086 | .789 | |
| 48 | 1.495 | .782 | 1.40 | .713 | .010 | 5 | .696 | .086 | .799 | |
| 49 | 1.496 | .778 | 1.41 | .718 | .005 | 5 | .693 | .085 | .808 | |
| 50 | 1.497 | .761 | 1.41 | .736 | .018 | 5 | .678 | .083 | .819 | Do. |
| 51 | 1.497 | .755 | 1.42 | .742 | .006 | 5 | .673 | .082 | .824 | Do. |
| 52 | 1.494 | .746 | 1.43 | .748 | .006 | 5 | .665 | .081 | .829 | Do. |
| 53 | 1.496 | .743 | 1.44 | .753 | .005 | 5 | .662 | .081 | .834 | Do. |
| 54 | 1.495 | .738 | 1.44 | .757 | .004 | 5 | .658 | .080 | .837 | |
| 55 | 1.496 | .730 | 1.45 | .766 | .009 | 5 | .651 | .079 | .845 | |
| 56 | 1.494 | .723 | 1.45 | .771 | .005 | 5 | .644 | .079 | .850 | |
| 57 | 1.494 | §.709 | 1.46 | .785 | .014 | 5 | .632 | .077 | .862 | Do. |
| 58 | 1.495 | .709 | 1.47 | .786 | .001 | 5 | .632 | .077 | .863 | |
| 59 | 1.493 | .698 | 1.48 | .795 | .009 | 5 | .623 | .075 | .870 | |
| 60 | 1.495 | .694 | 1.49 | .801 | .006 | 5 | .619 | .075 | .876 | |
| 61 | 1.494 | .688 | 1.50 | .806 | .005 | 5 | .614 | .074 | .880 | |
| 62 | 1.495 | .681 | 1.51 | .814 | .008 | 5 | .609 | .072 | .886 | |
| 63 | 1.492 | .675 | 1.52 | .817 | .008 | 5 | .603 | .072 | .889 | |
| 64 | 1.494 | .669 | 1.52 | .825 | .008 | 5 | .597 | .072 | .897 | |

## IMPACT TESTS. LEAD CYLINDERS—Continued.

| Height of drop. | Height of specimen. | | Aproximate diameter after impact. | Decrement of height. | | Height of drop, second blow. | Height of specimen after impact. | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. | | | Successive. | Total. | |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | |
| 65 | 1.498 | .662 | 1.58 | .831 | .006 | 5 | .591 | .071 | .902 | |
| 66 | 1.495 | .657 | 1.54 | .838 | .007 | 5 | .587 | .070 | .908 | |
| 67 | 1.494 | .651 | 1.55 | .843 | .005 | 5 | .581 | .070 | .913 | |
| 68 | 1.492 | .640 | 1.55 | .852 | .009 | 5 | .572 | .068 | .920 | |
| 69 | 1.495 | .634 | 1.56 | .861 | .009 | 5 | .566 | .068 | .929 | |
| 70 | 1.495 | .614 | 1.57 | .881 | .020 | 5 | .558 | .061 | .942 | |
| 71 | 1.494 | .621 | 1.58 | .873 | −.008 | 5 | .554 | .067 | .940 | |
| 72 | 1.494 | .621 | 1.58 | .873 | 0. | 5 | .555 | .066 | .939 | |
| 73 | 1.495 | .611 | 1.59 | .884 | .011 | 5 | .546 | .065 | .949 | |

## Impact Tests. Lead Cylinders.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | |
|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. |
| *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inch.* | *Inch.* |
| 1 | .997 | .950 | 1.04 | .047 | .047 |
| 2 | .997 | .919 | 1.04 | .078 | .031 |
| 3 | .998 | .893 | 1.07 | .105 | .027 |
| 4 | .997 | .869 | 1.08 | .128 | .023 |
| 5 | .998 | .848 | 1.10 | .150 | .022 |
| 6 | .997 | .829 | 1.11 | .168 | .018 |
| 7 | .997 | .811 | 1.12 | .186 | .018 |
| 8 | .997 | .796 | 1.13 | .201 | .015 |
| 9 | .997 | .778 | 1.15 | .219 | .018 |
| 10 | .998 | .762 | 1.16 | .236 | .017 |
| 11 | .997 | .748 | 1.17 | .249 | .013 |
| 12 | .997 | .733 | 1.18 | .264 | .015 |
| 13 | .997 | .720 | 1.20 | .277 | .013 |
| 14 | .998 | .705 | 1.21 | .293 | .016 |
| 15 | .997 | .694 | 1.22 | .303 | .010 |
| 16 | .997 | .682 | 1.23 | .315 | .012 |
| 17 | .997 | .669 | 1.24 | .328 | .013 |
| 18 | .997 | .658 | 1.24 | .339 | .011 |
| 19 | .998 | .647 | 1.25 | .351 | .012 |
| 20 | .996 | .633 | 1.26 | .363 | .012 |
| 21 | .998 | .626 | 1.27 | .372 | .009 |
| 22 | .997 | .615 | 1.29 | .382 | .010 |
| 23 | .997 | .604 | 1.30 | .393 | .011 |
| 24 | .997 | .594 | 1.31 | .403 | .010 |
| 25 | .996 | .583 | 1.32 | .413 | .010 |
| 26 | .997 | .575 | 1.33 | .422 | .009 |
| 27 | .997 | .567 | 1.34 | .430 | .008 |
| 28 | .997 | .557 | 1.35 | .440 | .010 |
| 29 | .997 | .550 | 1.36 | .447 | .007 |
| 30 | .997 | .540 | 1.38 | .457 | .010 |
| 31 | .997 | .531 | 1.39 | .466 | .009 |
| 32 | .997 | .525 | 1.40 | .472 | .006 |
| 33 | .997 | .518 | 1.41 | .479 | .007 |
| 34 | .997 | .509 | 1.42 | .488 | .009 |
| 35 | .997 | .500 | 1.43 | .497 | .009 |
| 36 | .997 | .494 | 1.44 | .503 | .006 |
| 37 | .997 | .489 | 1.44 | .508 | .005 |
| 38 | .997 | .480 | 1.45 | .517 | .009 |
| 39 | .997 | .473 | 1.46 | .524 | .007 |
| 40 | .997 | .464 | 1.48 | .535 | .009 |
| 41 | .997 | .458 | 1.49 | .539 | .004 |
| 42 | .997 | .452 | 1.50 | .545 | .006 |
| 43 | .997 | .449 | 1.51 | .548 | .003 |
| 44 | .997 | .444 | 1.52 | .553 | .005 |
| 45 | .998 | .437 | 1.52 | .561 | .008 |
| 46 | .997 | .430 | 1.54 | .567 | .006 |
| 47 | .997 | .424 | 1.55 | .573 | .006 |
| 48 | .996 | .418 | 1.55 | .578 | .005 |
| 49 | .998 | .411 | 1.57 | .587 | .009 |
| 50 | .997 | .407 | 1.58 | .590 | .003 |
| 51 | .997 | .401 | 1.59 | .596 | .006 |
| 52 | .997 | .397 | 1.60 | .600 | .004 |

## IMPACT TESTS. LEAD CYLINDERS—Continued.

| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | |
|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. |
| *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inch.* | *Inch.* |
| 53 | .996 | .390 | 1.61 | .606 | .006 |
| 54 | .997 | .388 | 1.63 | .609 | .003 |
| 55 | .997 | .380 | 1.64 | .617 | .008 |
| 56 | .997 | .377 | 1.65 | .620 | .003 |
| 57 | .997 | .372 | 1.65 | .625 | .005 |
| 58 | .996 | .368 | 1.66 | .628 | .003 |
| 59 | .997 | .364 | 1.67 | .633 | .005 |
| 60 | .997 | .361 | 1.68 | .636 | .003 |
| 61 | .997 | .351 | 1.70 | .646 | .010 |
| 62 | .997 | .349 | 1.71 | .648 | .002 |
| 63 | .997 | .346 | 1.72 | .651 | .003 |
| 64 | .997 | .341 | 1.73 | .656 | .005 |
| 65 | .997 | .337 | 1.74 | .660 | .004 |
| 66 | .997 | .333 | 1.75 | .664 | .004 |
| 67 | .997 | .331 | 1.76 | .666 | .002 |
| 68 | .997 | .322 | 1.77 | .675 | .009 |
| 69 | .997 | .321 | 1.78 | .676 | .001 |
| 70 | .997 | .319 | 1.79 | .678 | .002 |
| 71 | .997 | .313 | 1.80 | .684 | .006 |
| 72 | .997 | .305 | 1.82 | .692 | .008 |
| 73 | .997 | .302 | 1.83 | .695 | .003 |

## IMPACT TESTS. LEAD CYLINDERS.

Lead from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | | Height of drop, second blow. | Height of specimen after impact. | Decrement of height. | |
|---|---|---|---|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. | | | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* |
| 1 | 1.593 | 1.575 | ..... | .078 | .078 | 5 | 1.315 | .200 | .278 |
| 2 | 1.594 | 1.467 | ..... | .127 | .049 | 5 | 1.250 | .217 | .344 |
| 3 | 1.595 | 1.426 | ..... | .169 | .042 | 5 | 1.208 | .218 | .387 |
| 4 | 1.595 | 1.389 | ..... | .206 | .037 | 5 | 1.178 | .211 | .417 |
| 5 | 1.594 | 1.353 | .87 | .241 | .035 | 5 | 1.147 | .206 | .447 |
| 6 | 1.595 | 1.324 | .88 | .271 | .030 | 5 | 1.123 | .201 | .472 |
| 7 | 1.594 | 1.293 | .89 | .301 | .030 | 5 | 1.097 | .196 | .497 |
| 8 | 1.595 | 1.268 | .90 | .327 | .026 | 5 | 1.077 | .191 | .518 |
| 9 | 1.594 | 1.241 | .91 | .353 | .026 | 5 | 1.054 | .187 | .540 |
| 10 | 1.595 | 1.219 | .92 | .376 | .023 | 5 | 1.036 | .183 | .559 |

## IMPACT TESTS. LEAD CYLINDERS—Continued.

| Height of drop. | Height of specimen. | | Approximate diameter after impact. | Decrement of height. | | Height of drop, second blow. | Height of specimen after impact. | Decrement of height. | |
|---|---|---|---|---|---|---|---|---|---|
| | Initial. | After impact. | | Total. | Successive. | | | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* |
| 11 | 1.594 | 1.196 | .93 | .398 | .022 | 5 | 1.016 | .180 | .578 |
| 12 | 1.596 | 1.171 | .94 | .425 | .027 | 5 | .997 | .174 | .599 |
| 13 | 1.592 | 1.148 | .95 | .444 | .019 | 5 | .978 | .170 | .614 |
| 14 | 1.595 | 1.132 | .96 | .463 | .019 | 5 | .964 | .168 | .631 |
| 15 | 1.593 | 1.107 | .97 | .486 | .023 | 5 | .942 | .165 | .651 |
| 16 | 1.595 | 1.089 | .98 | .506 | .020 | 5 | .928 | .161 | .667 |
| 17 | 1.594 | 1.068 | .99 | .526 | .020 | 5 | .911 | .157 | .683 |
| 18 | 1.595 | 1.046 | 1.00 | .549 | .023 | 5 | .893 | .153 | .702 |
| 19 | 1.593 | 1.029 | 1.01 | .564 | .015 | 5 | .878 | .151 | .715 |
| 20 | 1.593 | 1.011 | 1.02 | .582 | .018 | 5 | .862 | .149 | .731 |
| 21 | 1.593 | .994 | 1.03 | .599 | .017 | 5 | .849 | .145 | .744 |
| 22 | 1.593 | .978 | 1.04 | .615 | .016 | 5 | .835 | .143 | .758 |
| 23 | 1.594 | .962 | 1.04 | .632 | .017 | 5 | .822 | .140 | .772 |
| 24 | 1.595 | .949 | 1.05 | .646 | .014 | 5 | .810 | .139 | .785 |
| 25 | 1.594 | .932 | 1.06 | .662 | .016 | 5 | .797 | .135 | .797 |
| 26 | 1.593 | .921 | 1.07 | .672 | .010 | 5 | .787 | .134 | .806 |
| 27 | 1.593 | .902 | 1.08 | .691 | .019 | 5 | .771 | .131 | .822 |
| 28 | 1.592 | .889 | 1.09 | .703 | .012 | 5 | .760 | .129 | .832 |
| 29 | 1.592 | .875 | 1.10 | .717 | .014 | 5 | .748 | .127 | .844 |
| 30 | 1.594 | .864 | 1.11 | .730 | .013 | 5 | .739 | .125 | .855 |
| 31 | 1.594 | .853 | 1.12 | .741 | .011 | 5 | .730 | .123 | .864 |
| 32 | 1.594 | .841 | 1.13 | .753 | .012 | 5 | .720 | .121 | .874 |
| 33 | 1.594 | .825 | 1.14 | .769 | .016 | 5 | .706 | .119 | .888 |
| 34 | 1.595 | .813 | 1.14 | .782 | .013 | 5 | .697 | .116 | .898 |
| 35 | 1.594 | .803 | 1.15 | .791 | .009 | 5 | .688 | .115 | .906 |
| 36 | 1.594 | .792 | 1.16 | .802 | .011 | 5 | .679 | .113 | .915 |
| 37 | 1.594 | .777 | 1.17 | .817 | .015 | 5 | .666 | .111 | .928 |
| 38 | 1.595 | .765 | 1.18 | .830 | .013 | 5 | .657 | .108 | .938 |
| 39 | 1.595 | .755 | 1.19 | .840 | .010 | 5 | .648 | .107 | .947 |
| 40 | 1.594 | .746 | 1.20 | .848 | .008 | 5 | .641 | .105 | .953 |
| 41 | 1.594 | .735 | 1.21 | .859 | .011 | 5 | .631 | .104 | .963 |
| 42 | 1.594 | .726 | 1.21 | .868 | .009 | 5 | .624 | .102 | .970 |
| 43 | 1.593 | .710 | 1.22 | .883 | .015 | 5 | .610 | .100 | .983 |
| 44 | 1.594 | .702 | 1.23 | .892 | .009 | 5 | .604 | .098 | .990 |
| 45 | 1.594 | .686 | 1.25 | .908 | .016 | 5 | .590 | .096 | 1.004 |
| 46 | 1.593 | .678 | 1.25 | .915 | .007 | 5 | .583 | .095 | 1.010 |
| 47 | 1.594 | .675 | 1.26 | .919 | .004 | 5 | .580 | .095 | 1.014 |
| 48 | 1.593 | .661 | 1.27 | .932 | .013 | 5 | .569 | .092 | 1.024 |
| 49 | 1.593 | .653 | 1.28 | .940 | .008 | 5 | .562 | .091 | 1.031 |
| 50 | 1.594 | .644 | 1.29 | .950 | .010 | 5 | .555 | .089 | 1.039 |
| 51 | 1.595 | .635 | 1.30 | .960 | .010 | 5 | .547 | .088 | 1.048 |
| 52 | 1.592 | .623 | 1.31 | .969 | .009 | 5 | .536 | .087 | 1.056 |
| 53 | 1.593 | .615 | 1.32 | .978 | .009 | 5 | .530 | .085 | 1.063 |
| 54 | 1.591 | .608 | 1.33 | .983 | .005 | 5 | .524 | .084 | 1.067 |
| 55 | 1.593 | .598 | 1.34 | .995 | .012 | 5 | .516 | .082 | 1.077 |

## Impact Tests. Lead Cylinders.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

Successive blows of 1″ each given the same specimen.

| Height of drop. | | Height of specimen. | | Decrement of height. | |
|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* |
| 1 | 1 | 2.000 | 1.942 | .058 | .058 |
| 1 | 2 | ..... | 1.903 | .039 | .097 |
| 1 | 3 | ..... | 1.869 | .034 | .131 |
| 1 | 4 | ..... | 1.838 | .031 | .162 |
| 1 | 5 | ..... | 1.811 | .027 | .189 |
| 1 | 6 | ..... | 1.784 | .027 | .216 |
| 1 | 7 | ..... | 1.756 | .028 | .244 |
| 1 | 8 | ..... | 1.729 | .027 | .271 |
| 1 | 9 | ..... | 1.702 | .027 | .298 |
| 1 | 10 | ..... | 1.673 | .029 | .327 |
| 1 | 11 | ..... | 1.644 | .029 | .356 |
| 1 | 12 | ..... | 1.616 | .028 | .384 |
| 1 | 13 | ..... | 1.589 | .027 | .411 |
| 1 | 14 | ..... | 1.562 | .027 | .438 |
| 1 | 15 | ..... | 1.536 | .026 | .464 |
| 1 | 16 | ..... | 1.509 | .027 | .491 |
| 1 | 17 | ..... | 1.484 | .025 | .516 |
| 1 | 18 | ..... | 1.460 | .024 | .540 |
| 1 | 19 | ..... | 1.424 | .036 | .576 |
| 1 | 20 | ..... | 1.398 | .026 | .602 |
| 1 | 21 | ..... | 1.375 | .023 | .625 |
| 1 | 22 | ..... | 1.354 | .021 | .646 |
| 1 | 23 | ..... | 1.334 | .020 | .666 |
| 1 | 24 | ..... | 1.314 | .020 | .686 |
| 1 | 25 | ..... | 1.289 | .025 | .711 |
| 1 | 26 | ..... | 1.264 | .025 | .736 |
| 1 | 27 | ..... | 1.242 | .022 | .758 |
| 1 | 28 | ..... | 1.219 | .023 | .781 |
| 1 | 29 | ..... | 1.200 | .019 | .800 |
| 1 | 30 | ..... | 1.180 | .020 | .820 |
| 1 | 31 | ..... | 1.161 | .019 | .839 |
| 1 | 32 | ..... | 1.142 | .019 | .858 |
| 1 | 33 | ..... | 1.116 | .026 | .884 |
| 1 | 34 | ..... | 1.096 | .020 | .904 |
| 1 | 35 | ..... | 1.078 | .018 | .922 |
| 1 | 36 | ..... | 1.060 | .018 | .940 |
| 1 | 37 | ..... | 1.043 | .017 | .957 |
| 1 | 38 | ..... | 1.025 | .018 | .975 |
| 1 | 39 | ..... | 1.007 | .018 | .993 |
| 1 | 40 | ..... | .990 | .017 | 1.010 |
| 1 | 41 | ..... | .962 | .028 | 1.038 |

## Impact Tests. Lead Cylinders—Continued.

| Height of drop. | | Height of specimen. | | Decrement of height. | |
|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* |
| 1 | 42 | ..... | .944 | .018 | 1.056 |
| 1 | 43 | ..... | .928 | .016 | 1.072 |
| 1 | 44 | ..... | .914 | .014 | 1.086 |
| 1 | 45 | ..... | .902 | .012 | 1.098 |
| 1 | 46 | ..... | .889 | .013 | 1.111 |
| 1 | 47 | ..... | .876 | .013 | 1.124 |
| 1 | 48 | ..... | .863 | .013 | 1.137 |
| 1 | 49 | ..... | .849 | .014 | 1 151 |
| 1 | 50 | ..... | .833 | .016 | 1 167 |
| 1 | 51 | ..... | .819 | .014 | 1.181 |
| 1 | 52 | ..... | .807 | .012 | 1.193 |
| 1 | 53 | ..... | .795 | .012 | 1.205 |
| 1 | 54 | ..... | .783 | .012 | 1.217 |
| 1 | 55 | ..... | .772 | .011 | 1.228 |
| 1 | 56 | ..... | .759 | .013 | 1.241 |
| 1 | 57 | ..... | .747 | .012 | 1.253 |
| 1 | 58 | ..... | .734 | .013 | 1.266 |
| 1 | 59 | ..... | .723 | .011 | 1.277 |
| 1 | 60 | ..... | .711 | .012 | 1.289 |
| 1 | 61 | ..... | .700 | .011 | 1.300 |
| 1 | 62 | ..... | .690 | .010 | 1.310 |
| 1 | 63 | ..... | .680 | .010 | 1.320 |
| 1 | 64 | ..... | .669 | .011 | 1.331 |
| 1 | 65 | ..... | .659 | .010 | 1.341 |
| 1 | 66 | ..... | .648 | .011 | 1.352 |
| 1 | 67 | ..... | .636 | .012 | 1.364 |
| 1 | 68 | ..... | .625 | .011 | 1.375 |
| 1 | 69 | ..... | .614 | .011 | 1.386 |
| 1 | 70 | ..... | .605 | .009 | 1.395 |
| 1 | 71 | ..... | .597 | .008 | 1.403 |
| 1 | 72 | ..... | .588 | .009 | 1.412 |

## Impact Tests. Lead Cylinders.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

Successive blows of 2″ each given the same specimen.

| Height of drop | | Height of specimen. | | Decrement of height. | |
|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* |
| 2 | 2 | 1.999 | 1.898 | .101 | .101 |
| 2 | 4 | ..... | 1.835 | .063 | .164 |
| 2 | 6 | ..... | 1.782 | .053 | .217 |
| 2 | 8 | ..... | 1.729 | .053 | .270 |
| 2 | 10 | ..... | 1.665 | .064 | .334 |
| 2 | 12 | ..... | 1.590 | .075 | .409 |
| 2 | 14 | ..... | 1.539 | .051 | .460 |
| 2 | 16 | ..... | 1.494 | .045 | .506 |
| 2 | 18 | ..... | 1.446 | .048 | .553 |
| 2 | 20 | ..... | 1.396 | .050 | .603 |
| 2 | 22 | ..... | 1.349 | .047 | .650 |
| 2 | 24 | ..... | 1.306 | .043 | .693 |
| 2 | 26 | ..... | 1.264 | .042 | .735 |
| 2 | 28 | ..... | 1.219 | .045 | .780 |
| 2 | 30 | ..... | 1.180 | .039 | .819 |
| 2 | 32 | ..... | 1.138 | .042 | .861 |
| 2 | 34 | ..... | 1.091 | .047 | .908 |
| 2 | 36 | ..... | 1.057 | .034 | .942 |
| 2 | 38 | ..... | 1.021 | .036 | .978 |
| 2 | 40 | ..... | .986 | .035 | 1.013 |
| 2 | 42 | ..... | .951 | .035 | 1.048 |
| 2 | 44 | ..... | .921 | .030 | 1.078 |
| 2 | 46 | ..... | .892 | .029 | 1.107 |
| 2 | 48 | ..... | .857 | .035 | 1.142 |
| 2 | 50 | ..... | .830 | .027 | 1.169 |
| 2 | 52 | ..... | .803 | .027 | 1.196 |
| 2 | 54 | ..... | .776 | .027 | 1.223 |
| 2 | 56 | ..... | .750 | .026 | 1.249 |
| 2 | 58 | ..... | .718 | .032 | 1.281 |
| 2 | 60 | ..... | .696 | .022 | 1.303 |
| 2 | 62 | ..... | .674 | .022 | 1.325 |
| 2 | 64 | ..... | .647 | .027 | 1.352 |
| 2 | 66 | ..... | .627 | .020 | 1.372 |
| 2 | 68 | ..... | .608 | .019 | 1.391 |
| 2 | 70 | ..... | .588 | .020 | 1.411 |
| 2 | 72 | ..... | .568 | .020 | 1.431 |

## IMPACT TESTS. LEAD CYLINDERS.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

Successive blows given individual specimens.

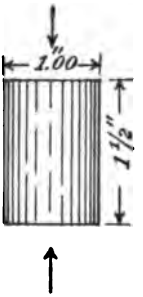
| Height of drop. | | Height of specimen. | | Decrement of height. | |
|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* |
| 6 | 6 | 2.000 | 1.784 | .216 | .216 |
| 6 | 12 | ..... | 1.642 | .142 | .358 |
| 6 | 18 | ..... | 1.488 | .154 | .512 |
| 6 | 24 | ..... | 1.360 | .128 | .640 |
| 6 | 30 | ..... | 1.225 | .135 | .775 |
| 6 | 36 | ..... | 1.112 | .113 | .888 |
| 6 | 42 | ..... | 1.004 | .108 | .996 |
| 6 | 48 | ..... | .906 | .098 | 1.094 |
| 6 | 54 | ..... | .816 | .090 | 1.184 |
| 6 | 60 | ..... | .735 | .081 | 1.265 |
| 6 | 66 | ..... | .659 | .076 | 1.341 |
| 6 | 72 | ..... | .593 | .066 | 1.407 |
| 12 | 12 | 2.000 | 1.654 | .346 | .346 |
| 12 | 24 | ..... | 1.369 | .285 | .631 |
| 12 | 36 | ..... | 1.140 | .229 | .860 |
| 12 | 48 | ..... | .952 | .188 | 1.048 |
| 12 | 60 | ..... | .797 | .155 | 1.203 |
| 12 | 72 | ..... | .667 | .130 | 1.333 |
| 24 | 24 | 2.000 | 1.458 | .542 | .542 |
| 12 | 36 | ..... | 1.210 | .248 | .790 |
| 12 | 48 | ..... | 1.011 | .199 | .989 |
| 12 | 60 | ..... | .847 | .164 | 1.153 |
| 12 | 72 | ..... | .709 | .138 | 1.291 |
| 36 | 36 | 2.000 | 1.305 | .695 | .695 |
| 12 | 48 | ..... | 1.086 | .219 | .914 |
| 12 | 60 | ..... | .909 | .177 | 1.091 |
| 12 | 72 | ..... | .761 | .148 | 1.239 |
| 48 | 48 | 2.000 | 1.181 | .819 | .819 |
| 12 | 60 | ..... | .984 | .197 | 1.016 |
| 12 | 72 | ..... | .924 | .060 | 1.076 |
| 72 | 72 | 2.000 | .979 | 1.021 | 1.021 |

The last specimen recorded in this table, before impact, was laid off with concentric circles marked on each end ".25, ".50, and ".75 diameters, respectively, and on the cylindrical surface sections ".25 apart

each. After impact these lines measured as follows: End diameters, ".34, ".66, 1".00, and ".36, ".68, 1".02; surface sections, ".11, ".13, ".12, ".13, ".12, " 12, ".11, ".11. The lines were all somewhat sinuous.

## IMPACT TESTS. LEAD CYLINDERS.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.




Successive blows given individual specimens.

| Height of drop. | | Height of specimen. | | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. | |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* | |
| 6 | 6 | 1.495 | 1.299 | .196 | .196 | |
| 6 | 12 | ..... | 1.143 | .156 | .352 | |
| 6 | 18 | ..... | .999 | .144 | .496 | |
| 6 | 24 | ..... | .871 | .128 | .624 | |
| 6 | 30 | ..... | .759 | .112 | .736 | |
| 6 | 36 | ..... | .663 | .096 | .832 | |
| 6 | 42 | ..... | .580 | .083 | .915 | |
| 6 | 48 | ..... | .508 | .072 | .987 | |
| 6 | 54 | ..... | .444 | .064 | 1.051 | |
| 6 | 60 | ..... | .388 | .056 | 1.107 | |
| 6 | 66 | ..... | a.337 | .051 | 1.158 | Expanded beyond the face of the hammer. |
| 6 | 72 | ..... | a.300 | .037 | 1.195 | Do. |
| 12 | 12 | 1.494 | 1.184 | .310 | .310 | |
| 12 | 24 | ..... | .941 | .243 | .553 | |
| 12 | 36 | ..... | .754 | .187 | .740 | |
| 12 | 48 | ..... | .607 | .147 | .887 | |
| 12 | 60 | ..... | .489 | .118 | 1.005 | |
| 12 | 72 | ..... | a.395 | .094 | 1.099 | Do. |
| 24 | 24 | 1.498 | 1.011 | .482 | .482 | |
| 24 | 48 | ..... | .694 | .317 | .799 | |
| 24 | 72 | ..... | .487 | .207 | 1.006 | |

a About.

## IMPACT TESTS. LEAD CYLINDERS.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

Successive blows of 5″ each given the same specimen.

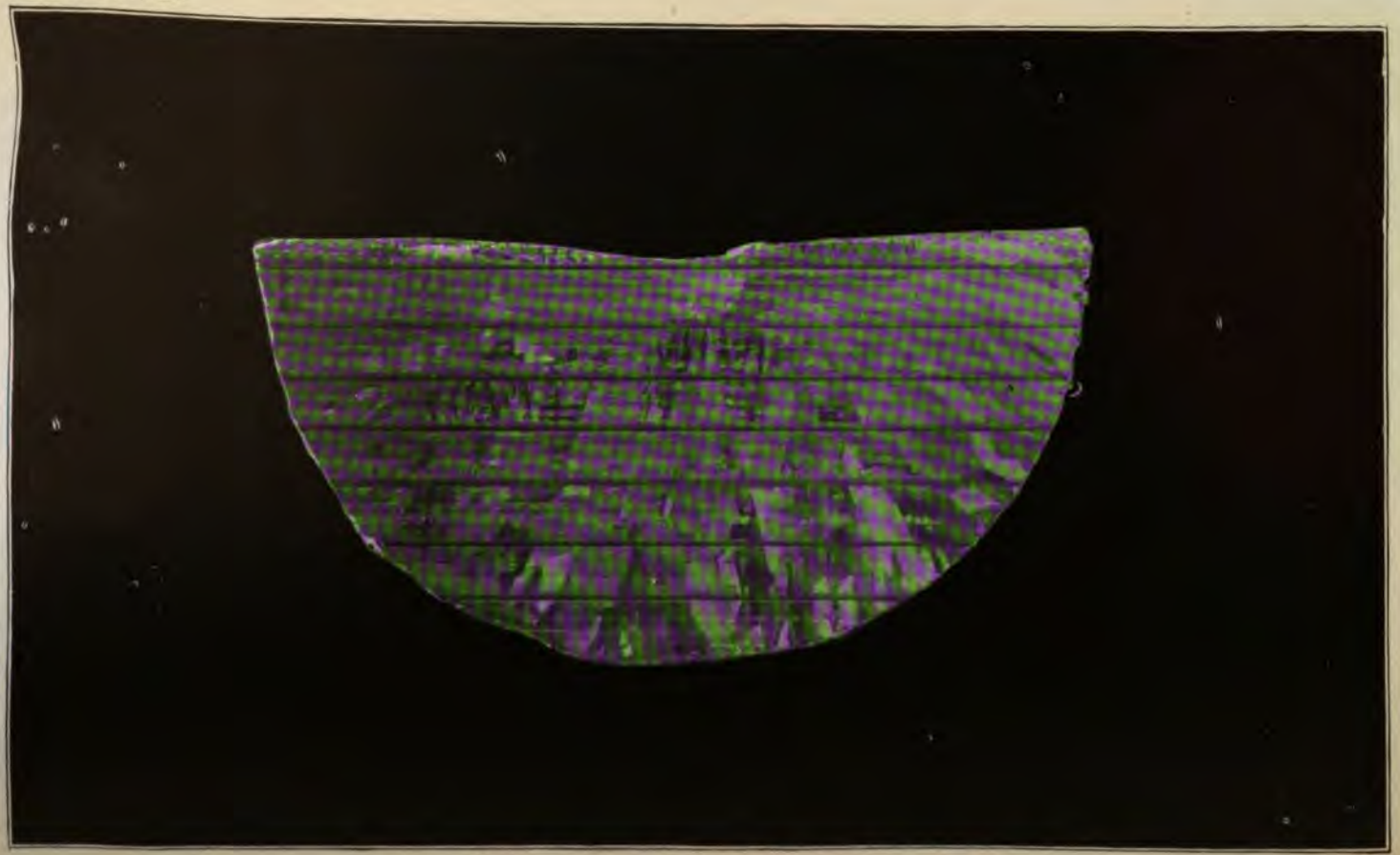
| Height of drop. | | Height of specimen. | | Decrement of height. | |
|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inches.* |
| 5 | 5 | 1.593 | 1.358 | .235 | .235 |
| 5 | 10 | ..... | 1.156 | .202 | .437 |
| 5 | 15 | ..... | .986 | .170 | .607 |
| 5 | 20 | ..... | .842 | .144 | .751 |
| 5 | 25 | ..... | .720 | .122 | .873 |
| 5 | 30 | ..... | .616 | .104 | .977 |
| 5 | 35 | ..... | .528 | .088 | 1.065 |
| 5 | 40 | ..... | .454 | .074 | 1.139 |
| 5 | 45 | ..... | .396 | .058 | 1.197 |
| 5 | 50 | ..... | .337 | .059 | 1.256 |
| 5 | 55 | ..... | .290 | .047 | 1.303 |

## Impact Tests. Lead Cylinders.

Lead rod from the Boston Lead Manufacturing Company.
Weight of ram, 77 pounds.

Successive blows given individual specimens, with intervals of rest between some of the blows.

| Height of drop. | | Height of specimen. | | Decrement of height. | | Interval of rest since preceding blow. | |
|---|---|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. | | |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Days.* | *Hours.* |
| 1 | 1 | 1.999 | 1.940 | .059 | .059 | ..... | ..... |
| 1 | 2 | ..... | 1.898 | .042 | .101 | ..... | 2 |
| 1 | 3 | ..... | 1.858 | .040 | .141 | ..... | 20 |
| 1 | 4 | ..... | 1.823 | .035 | .176 | ..... | 29 |
| 1 | 5 | ..... | 1.785 | .038 | .214 | ..... | 24 |
| 1 | 6 | ..... | 1.743 | .042 | .256 | 2 | 18 |
| 1 | 7 | ..... | 1.711 | .032 | .288 | ..... | ..... |
| 1 | 8 | ..... | 1.658 | .053 | .341 | 4 | ..... |
| 1 | 9 | ..... | 1.622 | .036 | .377 | 4 | ..... |
| 1 | 10 | ..... | 1.592 | .030 | .407 | ..... | ..... |
| 1 | 1 | 1.999 | 1.940 | .059 | .059 | ..... | ..... |
| 1 | 2 | ..... | 1.900 | .040 | .099 | ..... | ..... |
| 1 | 3 | ..... | 1.866 | .034 | .133 | ..... | ..... |
| 1 | 4 | ..... | 1.835 | .031 | .164 | ..... | ..... |
| 1 | 5 | ..... | 1.785 | .050 | .214 | ..... | 22 |
| 1 | 6 | ..... | 1.750 | .035 | .249 | ..... | ..... |
| 1 | 7 | ..... | 1.720 | .030 | .279 | ..... | ..... |
| 1 | 8 | ..... | 1.666 | .054 | .333 | ..... | 30 |
| 1 | 9 | ..... | 1.632 | .034 | .367 | ..... | ..... |
| 1 | 10 | ..... | 1.597 | .035 | .402 | ..... | 24 |
| 1 | 11 | ..... | 1.569 | .028 | .430 | ..... | ..... |
| 1 | 12 | ..... | 1.517 | .052 | .482 | 2 | 18 |
| 1 | 13 | ..... | 1.483 | .034 | .516 | 4 | ..... |
| 1 | 14 | ..... | 1.443 | .040 | .556 | 4 | ..... |
| 1 | 15 | ..... | 1.415 | .028 | .584 | ..... | ..... |
| 1 | 1 | 1.999 | 1.939. | .060 | .060 | ..... | ..... |
| 1 | 2 | ..... | 1.898 | .041 | .101 | ..... | ..... |
| 1 | 3 | ..... | 1.865 | .033 | .134 | ..... | ..... |
| 1 | 4 | ..... | 1.834 | .031 | .165 | ..... | ..... |
| 1 | 5 | ..... | 1.790 | .044 | .209 | ..... | 1½ |
| 1 | 6 | ..... | 1.757 | .033 | .242 | ..... | ..... |
| 1 | 7 | ..... | 1.727 | .030 | .272 | ..... | ..... |
| 1 | 8 | ..... | 1.700 | .027 | .299 | ..... | ..... |
| 1 | 9 | ..... | 1.644 | .056 | .355 | ..... | 20 |
| 1 | 10 | ..... | 1.610 | .034 | .389 | ..... | ..... |
| 1 | 11 | ..... | 1.581 | .029 | .418 | ..... | ..... |
| 1 | 12 | ..... | 1.529 | .052 | .470 | ..... | 30 |
| 1 | 13 | ..... | 1.498 | .031 | .501 | ..... | ..... |
| 1 | 14 | ..... | 1.464 | .034 | .535 | ..... | 24 |
| 1 | 15 | ..... | 1.438 | .026 | .561 | ..... | ..... |
| 1 | 16 | ..... | 1.391 | .047 | .608 | 2 | 18 |
| 1 | 17 | ..... | 1.359 | .032 | .640 | 4 | ..... |
| 1 | 18 | ..... | 1.323 | .036 | .676 | 4 | ..... |



CROSS SECTION OF A PIG OF LEAD, SHOWING THE CRYSTALLINE STRUCTURE.

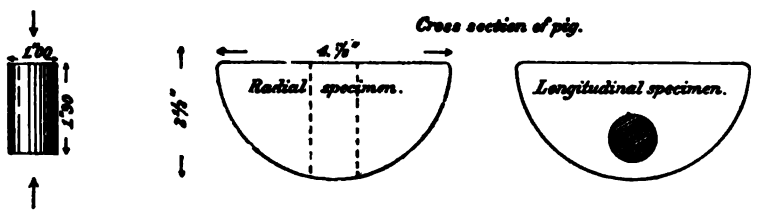
NOTE.—The parallel lines across the photograph were made by the tool in machining.

## IMPACT TESTS. LEAD CYLINDERS—Continued.

| Height of drop. | | Height of specimen. | | Decrement of height. | | Interval of rest since preceding blow. | |
|---|---|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. | | |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | *Days.* | *Hours.* |
| 1 | 1 | 2.001 | 1.940 | .061 | .061 | ..... | ..... |
| 1 | 2 | ..... | 1.895 | .045 | .106 | 2 | 1 |
| 1 | 3 | ..... | 1.857 | .038 | .144 | 2 | 18 |
| 1 | 4 | ..... | 1.819 | .038 | .182 | 4 | ..... |
| 1 | 5 | ..... | 1.777 | .042 | .224 | 4 | ..... |
| 1 | 6 | ..... | 1.744 | .033 | .257 | ..... | ..... |
| 1 | 1 | 2.000 | 1.940 | .060 | .060 | ..... | ..... |
| 1 | 2 | ..... | 1.899 | .041 | .101 | ..... | ..... |
| 1 | 3 | ..... | 1.865 | .034 | .135 | ..... | ..... |
| 1 | 4 | ..... | 1.834 | .031 | .166 | ..... | ..... |
| 1 | 5 | ..... | 1.805 | .029 | .195 | ..... | ..... |
| 1 | 6 | ..... | 1.777 | .028 | .223 | ..... | ..... |
| 1 | 7 | ..... | 1.721 | .056 | .279 | 2 | 1 |
| 1 | 8 | ..... | 1.683 | .038 | .317 | ..... | 24 |
| 1 | 9 | ..... | 1.652 | .031 | .348 | ..... | ..... |
| 1 | 10 | ..... | 1.600 | .052 | .400 | 2 | 18 |
| 1 | 11 | ..... | 1.564 | .036 | .436 | 4 | ..... |
| 1 | 12 | ..... | 1.524 | .040 | .476 | 4 | ..... |
| 1 | 13 | ..... | 1.494 | .030 | .506 | ..... | ..... |

When no interval of rest is recorded the blows immediately followed each other.

## IMPACT TESTS. LEAD CYLINDERS.




Specimens from a pig branded "Omaha & Grant Refined."
Radial specimens marked A, B, C, and D. Longitudinal specimens marked E, F, G, H, and I.
Weight of ram, 77 pounds.
Single and successive blows given individual specimens.

| Mark on specimen. | Height of drop. | | Height of specimen. | | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | Successive. | Total. | Initial. | After impact. | Successive. | Total. | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | |
| A.... | 6 | 6 | 1.900 | 1.633 | .267 | .267 | |
| | 6 | 12 | ..... | 1.469 | .164 | .431 | |
| | 6 | 18 | ..... | 1.334 | .135 | .566 | |
| | 6 | 24 | ..... | 1.214 | .120 | .686 | |
| | 6 | 30 | ..... | 1.106 | .108 | .794 | |
| | 6 | 36 | ..... | .980 | .126 | .920 | Blow delivered after resting 4 days. |
| | 24 | 60 | ..... | .706 | .274 | 1.194 | |

## IMPACT TESTS. LEAD CYLINDERS—Continued.

| Mark on specimen. | Height of drop. | | Height of specimen. | | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | Successive. | Total. | Initial. | After impact. | Successive. | Total. | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | |
| B.... | 6 | 6 | 1.900 | 1.638 | .262 | .262 | |
| | 6 | 12 | ..... | 1.477 | .161 | .423 | |
| | 6 | 18 | ..... | 1.307 | .170 | .593 | Blow delivered after resting 4 days. |
| | 42 | 60 | ..... | .797 | .510 | 1.108 | |
| C.... | 60 | 60 | 1.901 | .885 | 1.016 | 1.016 | Approximate diameters after impact..... |
| D.... | 30 | 30 | 1.901 | 1.182 | .719 | .719 | Approximate diameter after impact, 1.″16. |
| | 30 | 60 | ..... | .804 | .378 | 1.097 | Blow delivered after resting 5 days. Approximate diameter after impact, 1.″43. |
| E.... | 6 | 6 | 1.899 | 1.633 | .266 | .266 | |
| | 6 | 12 | ..... | 1.475 | .158 | .424 | |
| | 6 | 18 | ..... | 1.366 | .139 | .563 | |
| | 6 | 24 | ..... | 1.220 | .116 | .679 | |
| | 6 | 30 | ..... | 1.112 | .108 | .787 | Approximate diameters after impact..... |
| | 6 | 36 | ..... | .987 | .125 | .912 | Blow delivered after resting 4 days. |
| | 24 | 60 | ..... | .718 | .269 | 1.181 | Approximate diameters after impact..... |
| F.... | 6 | 6 | 1.900 | 1.644 | .256 | .256 | |
| | 6 | 12 | ..... | 1.487 | .157 | .413 | |
| | 48 | 60 | ..... | .854 | .633 | 1.046 | Blow delivered after resting 4 days. Approximate diameters after impact..... |
| G.... | 6 | 6 | 1.899 | 1.643 | .256 | .256 | Approximate diameters after impact ..... |
| | 54 | 60 | ..... | .881 | .762 | 1.018 | Blow delivered after resting 4 days. Approximate diameters after impact..... |
| H.... | 60 | 60 | 1.901 | .870 | 1.031 | 1.031 | Approximate diameters after impact ..... |
| I..... | 30 | 30 | 1.900 | 1.187 | .713 | .713 | Approximate diameters after impact ..... |
| | 30 | 60 | ..... | .809 | .378 | 1.091 | Blow delivered after resting 4 days. Approximate diameters after impact..... |

The maximum diametrical flow occurred in the direction of th length of the crystals of the lead.

THREE VIEWS OF A SPECIMEN FROM A PIG OF LEAD AFTER IMPACT, SHOWING GREATEST LATERAL FLOW IN THE DIRECTION OF THE LONGITUDINAL AXES OF THE CRYSTALS.

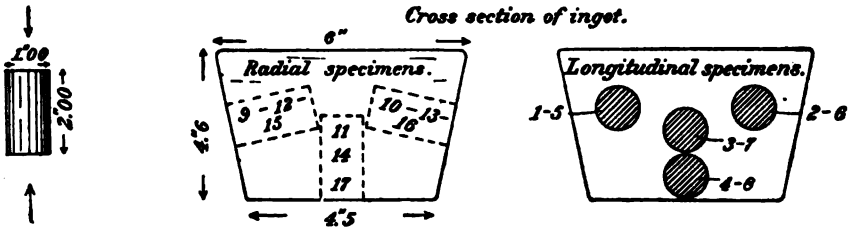
CROSS SECTION OF INGOT OF TIN, SHOWING THE CRYSTALLINE STRUCTURE.

No. 13. No. 6.

APPEARANCE OF TIN SPECIMENS AFTER IMPACT.

No. 6. Compressed perpendicular to the longitudinal axes of the crystals.
No. 13. Compressed parallel to the longitudinal axes of the crystals.

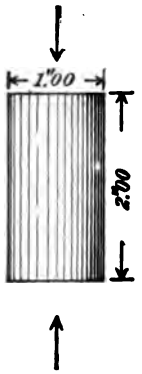
## IMPACT TESTS. TIN CYLINDERS.




Specimens from the ingot.
Weight of ram, 77 pounds.
Single and successive blows given individual specimens.

| Marks on specimens. | Height of drop. | | Height of specimen. | | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | Successive. | Total. | Initial. | After impact. | Successive. | Total. | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | |
| 1 | 5 | 5 | 2.001 | 1.911 | .090 | .090 | |
| | 5 | 10 | ..... | 1.857 | .054 | .144 | |
| | 5 | 15 | ..... | 1.809 | .048 | .192 | |
| | 5 | 20 | ..... | 1.764 | .045 | .237 | Cross section after impact elliptical, the greater flow occurring perpendicular to the longitudinal axes of the crystals of the tin. |
| | 5 | 25 | ..... | 1.722 | .042 | .279 | |
| 2 | 25 | 25 | 2.001 | 1.796 | .205 | .205 | Do. |
| 3 | 25 | 25 | 2.001 | 1.780 | .221 | .221 | |
| 4 | 25 | 25 | 2.001 | 1.766 | .235 | .235 | |
| 5 | 50 | 50 | 2.001 | 1.646 | .355 | .355 | |
| 6 | 72 | 72 | 2.002 | 1.522 | .480 | .480 | |
| 7 | 72 | 72 | 2.001 | 1.499 | .502 | .502 | Do. |
| 8 | 72 | 72 | 2.001 | 1.517 | .484 | .484 | |
| 9 | 25 | 25 | 2.001 | 1.686 | .315 | .315 | |
| 10 | 5 | 5 | 2.001 | 1.885 | .116 | .116 | |
| | 5 | 10 | ..... | 1.811 | .074 | .190 | |
| | 5 | 15 | ..... | 1.747 | .064 | .254 | |
| | 5 | 20 | ..... | 1.689 | .058 | .312 | |
| | 5 | 25 | ..... | 1.637 | .052 | .364 | |
| 11 | 25 | 25 | 2.001 | 1.704 | .297 | .297 | Constricted section near end of specimen after impact. |
| 12 | 6 | 6 | 2.001 | 1.885 | .116 | .116 | Longitudinal axes of crystals of the tin oblique to the axis of the specimen. |
| | 6 | 12 | ..... | 1.831 | .054 | .170 | |
| | 6 | 18 | ..... | 1.785 | .046 | .216 | |
| 13 | 72 | 72 | 2.001 | 1.438 | .563 | .563 | |
| 14 | 25 | 25 | 2.001 | 1.700 | .301 | .301 | Constricted section near end of specimen after impact. |
| 15 | 6 | 6 | 2.001 | 1.876 | .125 | .125 | |
| | 6 | 12 | ..... | 1.792 | .084 | .209 | |
| | 6 | 18 | ..... | 1.720 | .072 | .281 | |
| | 6 | 24 | ..... | 1.655 | .065 | .346 | |
| | 6 | 30 | ..... | 1.598 | .057 | .403 | |
| | 6 | 36 | ..... | 1.547 | .051 | .454 | |
| | 6 | 42 | ..... | 1.502 | .045 | .499 | |
| | 6 | 48 | ..... | 1.461 | .041 | .540 | |
| | 6 | 54 | ..... | 1.423 | .038 | .578 | |
| | 6 | 60 | ..... | 1.388 | .035 | .613 | |
| | 6 | 66 | ..... | 1.354 | .034 | .647 | |
| | 6 | 72 | ..... | 1.318 | .036 | .683 | The last blow delivered after an interval of rest of 20 days. |
| 17 | 50 | 50 | 2.001 | 1.546 | .455 | .455 | Constricted section near end of specimen after impact. |

## Impact Tests. Tin Cylinders.



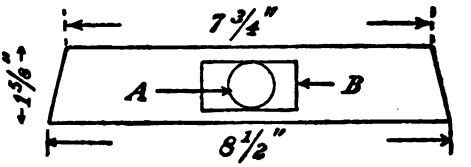

Specimens from metal recast from the ingot in an iron mold.
Weight of ram, 77 pounds.
Single and successive blows given individual specimens.

| Height of drop. | | Height of specimen. | | Decrement of height. | |
|---|---|---|---|---|---|
| Successive. | Total. | Initial. | After impact. | Successive. | Total. |
| *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* |
| 72 | 72 | 2.000 | 1.568 | .432 | .432 |
| 12 | 12 | 2.001 | 1.888 | .113 | .113 |
| 12 | 24 | ..... | 1.805 | .063 | .196 |
| 12 | 36 | ..... | 1.731 | .074 | .270 |
| 12 | 48 | ..... | 1.662 | .069 | .339 |
| 12 | 60 | ..... | 1.599 | .063 | .402 |
| 12 | 72 | ..... | 1.538 | .061 | .463 |
| 6 | 6 | 2.001 | 1.928 | .073 | .073 |
| 6 | 12 | ..... | 1.873 | .055 | .128 |
| 6 | 18 | ..... | 1.825 | .048 | .176 |
| 6 | 24 | ..... | 1.780 | .045 | .221 |
| 6 | 30 | ..... | 1.738 | .042 | .263 |
| 6 | 36 | ..... | 1.697 | .041 | .304 |
| 6 | 42 | ..... | 1.659 | .038 | .342 |
| 6 | 48 | ..... | 1.621 | .038 | .380 |
| 6 | 54 | ..... | 1.586 | .035 | .415 |
| 6 | 60 | ..... | 1.552 | .034 | .449 |
| 6 | 66 | ..... | 1.518 | .034 | .483 |
| 6 | 72 | ..... | 1.486 | .032 | .515 |

The last blow of 6″ was delivered after the specimen had rested an interval of 14 days.

CROSS SECTION OF SLAB OF ZINC, SHOWING THE CRYSTALLINE STRUCTURE.

## IMPACT TESTS. ZINC CYLINDERS.




Specimens from a cast slab branded "R. Lanyon's Son's Co., Iola, Kans."

Weight of ram, 77 pounds.

Specimen A taken out longitudinally, specimen B in a crosswise direction from the slab.

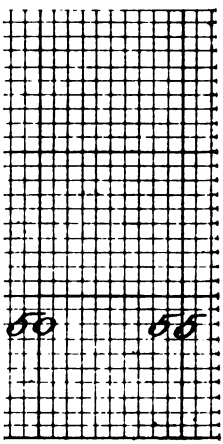
Successive blows given individual specimens.

| Marks. | Height of drop. | | Height of specimen. | | Decrement of height. | | Remarks. |
|---|---|---|---|---|---|---|---|
| | Successive. | Total. | Initial. | After impact. | Successive. | Total. | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inch.* | *Inch.* | |
| A | 6 | 6 | 2.000 | 1.946 | .056 | .056 | |
| | 6 | 12 | ..... | 1.912 | .034 | .090 | |
| | 6 | 18 | ..... | 1.884 | .028 | .118 | Minute cracks opened in cylindrical surface. |
| | 6 | 24 | ..... | 1.858 | .026 | .144 | Specimen slightly elliptic in cross-section dimensions, major diameter perpendicular to the longitudinal axes of the crystals of the zinc. |
| B | 6 | 6 | 2.001 | 1.947 | .054 | .054 | |
| | 6 | 12 | ..... | 1.915 | .032 | .086 | |
| | 6 | 18 | ..... | 1.889 | .026 | .112 | Minute cracks opened in cylindrical surface. |
| | 6 | 24 | ..... | 1.866 | .023 | .135 | |

## IMPACT TESTS. COPPER CYLINDERS.

Copper cylinders for use in crusher gauges.
Metal purchased at Frankford Arsenal, September, 1896.
Weight of ram, 77 pounds.
See page 399, report of 1898, for table of compression tests.

| Height of drop. | Series I. | | | Series II. | | | Series III. | | | Mean decrement of height. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Height. | | Decrement of height. | Height. | | Decrement of height. | Height. | | Decrement of height. | |
| | Initial. | After impact. | | Initial. | After impact. | | Initial. | After impact. | | |
| *Inches.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* | *Inch.* |
| 1 | .4991 | .4461 | .0530 | .4991 | .4463 | .0528 | .4990 | .4462 | .0528 | .0529 |
| 2 | .4992 | .4147 | .0845 | .4993 | .4162 | .0831 | .4988 | .4148 | .0840 | .0839 |
| 3 | .4992 | .3899 | .1093 | .4989 | .3920 | .1069 | .4991 | .3884 | .1107 | .1090 |
| 4 | .4991 | .3681 | .1310 | .4993 | .3674 | .1319 | .4992 | .3694 | .1298 | .1309 |
| 5 | .4993 | .3497 | .1496 | .4993 | .3505 | .1488 | .4994 | .3506 | .1488 | .1491 |
| 6 | .4990 | .3326 | .1664 | .4995 | .3371 | .1624 | .4992 | .3354 | .1638 | .1642 |
| 7 | .5994 | .3181 | .1813 | .4992 | .3186 | .1806 | .4993 | .3193 | .1800 | .1806 |
| 8 | .4990 | .3058 | .1937 | .4988 | .3046 | .1942 | .4991 | .3061 | .1930 | .1936 |
| 9 | .4994 | .2924 | .2070 | .4992 | .2923 | .2069 | .4988 | .2927 | .2061 | .2067 |
| 10 | .4990 | .2800 | .2190 | .4998 | .2808 | .2190 | .4986 | .2791 | .2195 | .2192 |
| 11 | .4995 | .2693 | .2302 | .4990 | .2677 | .2313 | .4998 | .2684 | .2309 | .2308 |
| 12 | .4996 | .2585 | .2411 | .4994 | .2584 | .2410 | .4992 | .2561 | .2431 | .2417 |
| 13 | .4999 | .2489 | .2510 | .4992 | .2489 | .2503 | .4997 | .2501 | .2496 | .2503 |
| 14 | .4994 | .2389 | .2605 | .4995 | .2372 | .2623 | .4995 | .2418 | .2577 | .2602 |
| 15 | .4997 | .2277 | .2720 | .4998 | .2308 | .2690 | .4992 | .2289 | .2708 | .2704 |
| 16 | .4997 | .2206 | .2791 | .4993 | .2217 | .2776 | .4997 | .2197 | .2800 | .2789 |
| 17 | .4997 | .2139 | .2858 | .4994 | .2180 | .2814 | .4995 | .2099 | .2896 | .2856 |
| 18 | .4998 | .2039 | .2957 | .4992 | .2088 | .2904 | .4995 | .2036 | .2959 | .2940 |
| 19 | .4995 | .1970 | .3025 | .4990 | .1949 | .3041 | .4996 | .2002 | .2994 | .3020 |
| 20 | .4992 | .1890 | .3102 | .4995 | .1912 | .3083 | .4990 | .1878 | .3112 | .3098 |
| 21 | .4992 | .1820 | .3172 | .4998 | .1809 | .3189 | .4997 | .1817 | .3180 | .3180 |
| 22 | .4998 | .1742 | .3256 | .4992 | .1777 | .3215 | .4995 | .1748 | .3247 | .3239 |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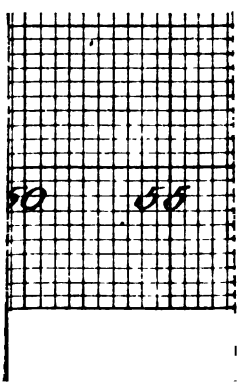
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# ARTILLERY HARNESS TRACES.

## TENSION TESTS.

## WHEEL TRACES FROM ROCK ISLAND ARSENAL.

Length, 53″; width, 2¼″; thickness, 0″.54.
Initial load, 100 pounds.
Elongations measured on full length of trace.

| No. of test. | Description. | Elongations under loads in pounds of— | | | | | | | | | Tensile strength. | Parted. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 500. | 1,000. | 1,500. | 2,000. | 2,500. | 3,000. | 3,500. | 4,000. | Maximum. | | |
| | | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Pounds.* | |
| 9592 | Stitched trace | 2.00 | 3.85 | 5.36 | 6.80 | ..... | ..... | ..... | ..... | ..... | 2,427 | 11″ from end. |
| 9593 | .....do | 2.10 | 3.83 | 5.27 | 6.69 | 8.05 | ..... | ..... | ..... | 8.90 | 2,755 | 12½″ from end. |
| 9594 | .....do | 2.50 | 4.56 | 6.18 | 7.70 | 9.31 | ..... | ..... | ..... | 9.52 | 2,506 | 12½″ from end. |
| 9595 | .....do | 2.90 | 5.22 | 6.94 | 8.58 | ..... | ..... | ..... | ..... | 9.10 | 2,114 | 12″ from end. |

Length, 51½″; width, 2.24″; thickness, 0″.60.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9627 | Stitched trace with rawhide strip | .62 | 2.72 | 4.53 | 6.00 | 7.19 | 8.60 | 10.04 | 11.30 | 12.10 | 4,098 | At the dee at end of trace. |
| 9628 | .....do | .76 | 3.07 | 4.83 | 6.48 | 7.90 | 9.10 | 10.45 | ..... | 10.45 | 3,500 | 9″ from end of trace and 2½ from end of joint. |

## Wheel Traces from The Congdon & Carpenter Company.

Length, 51½″; width, 2¼″; thickness, 0″.53.

| No. of test. | Description. | Elongations under loads in pounds of— | | | | | | | Tensile strength. | Parted. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 500. | 1,000. | 1,500. | 2,000. | 2,500. | 3,000. | Maximum. | | |
| | | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Pounds.* | |
| 9596 | No. 1—2½″. Rawhide full width and around the dees. Two rows rivets. Weight with rivets, 3⅝ pounds; without rivets, 3 pounds. | .87 | 2.90 | 4.65 | 6.07 | 7.63 | 9.07 | 10.65 | 3,232 | 13″ from end. |
| 9597 | No. 4—2½″. Narrow piece of rawhide around the dees, and runs down 5 inches. Two rows of rivets. Weight with rivets, 3⅛ pounds; without rivets, 3⅛ pounds. | 2.30 | 4.29 | 5.98 | 7.47 | ..... | ..... | 8.61 | 2,221 | 10″ from end. |
| 9598 | No. 6—2½″. All harness leather throughout. Riveted three rows, center row reversed. Weight with rivets, 3⅛ pounds; without rivets, 3 pounds. | 2.57 | 4.60 | 6.38 | ..... | ..... | ..... | ..... | 1,600 | 13″ from end. |
| 9599 | No. 8—2½″. Narrow strip of rawhide extending through the trace and around the dees. Riveted three rows, center row reversed. Weight with rivets, 3⅛ pounds; without rivets, 3⅛ pounds. | 1.74 | 3.46 | 5.02 | 6.24 | ..... | ..... | 7.51 | 2,418 | 12¼″ from end. |

## Lead Traces from Rock Island Arsenal.

Length, 7′ 11″; width, 1¾″; thickness, 0″.55.

| No. of test. | Description. | Elongations under loads in pounds of— | | | | | Tensile strength. | Parted. |
|---|---|---|---|---|---|---|---|---|
| | | 500. | 1,000. | 1,500. | 2,000. | Maximum. | | |
| | | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Pounds.* | |
| 9600 | Stitched trace | 4.30 | 7.60 | 10.42 | 13.21 | 14.00 | 2,148 | At middle of length. |
| 9601 | .....do | 4.13 | 7.65 | 10.60 | 13.46 | 14.93 | 2,249 | Do. |
| 9602 | .....do | 4.48 | 7.92 | 10.65 | 13.28 | 14.48 | 2,184 | Do. |
| 9603 | .....do | 3.83 | 7.06 | 9.87 | 12.50 | 15.00 | 2,397 | Do. |

## Lead Traces from The Congdon & Carpenter Company.

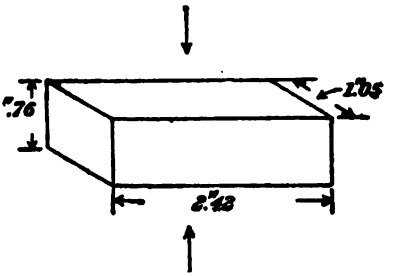
Length, 7′ 8½″ to 7′ 11″; width, 1¾″; thickness, 0″.48, excepting No. 5, which was 0″.45 thick.

| No. of test. | Description. | Elongations under loads in pounds of— | | | | | Tensile strength. | Parted. |
|---|---|---|---|---|---|---|---|---|
| | | 500. | 1,000. | 1,500. | 2,000. | Maximum. | | |
| | | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Pounds.* | |
| 9604 | No. 2—1¾″. Rawhide through full width and around the dees. Two rows of rivets. Weight with rivets, $4\frac{7}{16}$ pounds; without rivets, $3\frac{7}{16}$ pounds. | 2.42 | 7.05 | 10.20 | ..... | 12.80 | 1,927 | 31″ from end at joint. |
| 9605 | No. 3—1¾″. Narrow piece of rawhide around the dees, and runs down 5 inches. Two rows of rivets. Weight with rivets, $4\frac{1}{16}$ pounds; without rivets, $3\frac{3}{16}$ pounds. | 4.27 | 7.90 | 11.31 | ..... | 12.72 | 1,710 | 28″ from end at joint. |
| 9606 | No. 5—1¾″. All harness leather throughout. Three rows of rivets, center row reversed. Weight with rivets, $4\frac{3}{16}$ pounds; without rivets, $3\frac{3}{16}$ pounds. | 3.87 | 7.00 | 10.18 | ..... | 12.91 | 1,918 | At middle of length. |
| 9607 | No. 7—1¾″. Narrow strip of rawhide extending through the trace and around the dees. Riveted three rows, center row reversed. Weight with rivets, $4\frac{1}{16}$ pounds; without rivets, $3\frac{15}{16}$ pounds. | 3.63 | 7.06 | 9.86 | ..... | 13.40 | 1,902 | 28″ from end at joint. |

# COMPRESSION OF RUBBER.

## No. 9608.

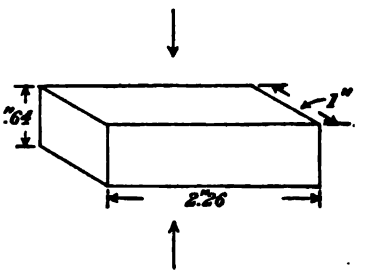
Sample from the Newton Rubber Works.




| Applied loads. | Remarks. |
|---|---|
| *Pounds.* 2,810 | Compressed rubber to ".38 thickness. |
| | Load removed, sample recovered to ".58 thickness. |
| 19,100 | Compressed sample to ".19 thickness. |
| | Load released, sample recovered to ".34 thickness. |

## No. 9609.

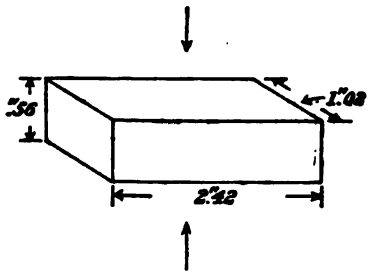
Samples marked $\overset{A}{\text{H. N. W}}$ayne.




| Applied loads. | Remarks. |
|---|---|
| *Pounds.* 3,060 | Compressed sample to ".32 thickness. |
| | Load released, sample recovered to ".59 thickness. |
| 25,000 | Compressed sample to ".16 thickness. |
| | Load released, sample recovered to ".28 thickness. |

No. 9610.

Sample marked $\frac{B.}{H.\ N.\ Wayne.}$




| Applied loads. | Remarks. |
|---|---|
| *Pounds.* | |
| 4,060 | Compressed sample to ".28 thickness. |
| | Load released, sample recovered to ".45 thickness. |
| 34,800 | Compressed sample to ".14 thickness. |
| | Load released, sample recovered to ".30 thickness. |

## COTTON TARGET CLOTH.

Samples 2" wide and 12" long between jaws of testing machine.

| No. of test. | No. of sample. | Submitted by— | Picks per inch. | | Elongation in 10". | | Tensile strength. | |
|---|---|---|---|---|---|---|---|---|
| | | | Warp. | Filling. | Warp. | Filling. | Warp. | Filling. |
| | | | | | *Inches.* | *Inches.* | *Pounds.* | *Pounds.* |
| 9630 | 1 | Manhattan Supply Co., New York City | 61 | 62 | 1.75 | 1.20 | 74 | 72 |
| | | | | | 1.75 | 1.15 | 82 | 66 |
| 9631 | 2 | Rufus P. Clarke, Washington, D. C | 62 | 61 | 1.70 | 1.30 | 69 | 79 |
| | | | | | 1.70 | 1.15 | 76 | 59 |
| 9632 | 3 | O. Jaffe & Pinkus, New York City | 61 | 60 | 1.85 | 1.15 | 78 | 78 |
| | | | | | 1.90 | ..... | 80 | 81 |
| 9633 | 4 | The F. W. McNeal Co., New York City | 61 | 61 | 1.80 | 1.35 | 72 | 68 |
| | | | | | 1.80 | 1.40 | 79 | 71 |
| 9634 | 5 | J. H. Early & Co., New York City | 61 | 60 | 1.90 | 1.10 | 73 | 78 |
| | | | | | 1.87 | 1.10 | 74 | 72 |
| 9635 | 6 | Catlin & Co., Boston, Mass | 40 | 37 | 1.93 | 1.55 | 113 | 125 |
| | | | | | 1.85 | 1.55 | 111 | 122 |
| 9636 | 7 | J. H. Lane, New York City | 44 | 49 | 1.55 | 1.45 | 145 | 174 |
| | | | | | 1.60 | 1.45 | 146 | 179 |
| 9637 | 8 | John Wanamaker, New York City | 54 | 60 | 1.85 | 1.35 | 99 | 142 |
| | | | | | 1.87 | 1.35 | 106 | 140 |

## NUT-LOCKING DEVICE.

SUBMITTED BY KAFADER BROTHERS, FORT BIDWELL, CAL.

The nut-locking device consists of a nut having a notched section on the underside, into which notches a circular spring pawl engages, operating in the manner of a ratchet and pawl movement.

The circular spring pawl is prevented from turning with the nut by reason of lugs engaging in a washer, which washer in turn engages

with the bolt by means of a lug entering a longitudinal groove in the latter.

The device is a positive lock against backing off the nut.

Two bolts were tested, one ½″ diameter and one ⅝″ diameter. The ½″ bolt and nut submitted for examination was tested by bolting together two iron plates.

The locking device was effective in preventing the nut from being backed off.

Increasing the force used on the wrench in setting up the nut, the nut was tightened until the bolt was twisted; at this time the lug on the washer was sheared off by the force employed. It appears, however, that the locking device has substantially the same strength as the body of the bolt.

The ⅝″ bolt and device were tested by bolting together two plates, the locking device being found effective.

The test was not carried so far as to cause the destruction of the bolt, the nut finally being removed by unlocking the circular spring pawl by means of the key provided for this purpose.

The nut may be locked at any position where a notch is opposite the spring pawl.

Increasing the number of notches on this nut, or using a bolt with a finer thread, would increase the opportunity for locking the nut with any desired pressure.

# CHEMICAL ANALYSES.

# CHEMICAL ANALYSES.

## BASE RINGS FOR GUN CARRIAGES.

| No. of tension test. | Marks. | Carbon. | | | Manganese. | Silicon. | Sulphur. | Phosphorus. |
|---|---|---|---|---|---|---|---|---|
| | | Total | Graphitic. | Combined. | | | | |
| 6217 | B R 139 E | 2.917 | 2.249 | 0.668 | 0.400 | 1.528 | 0.110 | 0.456 |
| 6248 | B R 145 E | 3.180 | 2.181 | 0.999 | 0.320 | 1.550 | 0.134 | 0.505 |
| 6286 | B R 154 E | 2.454 | 1.938 | 0.516 | 0.260 | 1.600 | 0.080 | 0.405 |
| a6286 | B R 154 E | 2.347 | 1.682 | 0.665 | 0.265 | 0.401 | ..... | 0.387 |

## RACERS FOR GUN CARRIAGES.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6216 | R-138 E | 2.781 | 2.236 | 0.545 | 0.422 | 1.280 | 0.126 | 0.460 |
| | 9-227 2 E | 3.190 | 2.609 | 0.581 | 0.458 | 0.910 | 0.100 | 0.309 |
| | 9-227 2 E-2 | 3.163 | 2.567 | 0.596 | 0.451 | 0.940 | 0.102 | 0.285 |
| | 9-227 3 E | 3.081 | 2.429 | 0.652 | 0.464 | 1.128 | 0.100 | 0.301 |
| | 9-227 4 E | 3.215 | 2.463 | 0.752 | 0.480 | 0.915 | 0.094 | 0.293 |

## BARREL FOR DYNAMITE GUN.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6252 | D G B | 2.781 | 2.557 | 0.224 | 0.300 | 1.950 | 0.120 | 0.696 |

a Chips taken from lump in metal.

## *CHEMICAL ANALYSES*—Continued.

### STEELS FROM SPRINGFIELD ARMORY.

| No. of tension test. | Description. | Marks. | Carbon. | Manganese. | Silicon. | Sulphur. | Phosphorus. | Copper. | Nickel. | Chromium. | Tungsten. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6029 | Rifle-barrel steel | B ✪ R | 0.716 | 0.180 | 0.310 | 0.010 | 0.032 | ..... | ..... | ..... | 1.940 | |
| 6102 | .....do | B ✪ W | 0.680 | ..... | 0.254 | 0.012 | 0.032 | ..... | ..... | ..... | ..... | |
| 6264 | .....do | 78 R | 0.503 | 1.120 | 0.190 | 0.045 | 0.031 | ..... | ..... | ..... | ..... | |
| 6265 | .....do | 78 R R | 0.533 | 0.874 | 0.190 | 0.048 | 0.035 | ..... | ..... | ..... | ..... | |
| 6263 | .....do | 78 B R | 0.560 | 1.175 | 0.310 | 0.045 | 0.032 | ..... | ..... | ..... | ..... | |
| 6262 | .....do | 78 B | 0.568 | 1.291 | 0.300 | 0.042 | 0.035 | ..... | ..... | ..... | ..... | |
| 6289 | .....do | A I G | 0.532 | 1.160 | 0.084 | 0.090 | 0.120 | ..... | None. | None. | None. | |
| 6290 | .....do | A I R | 0.490 | 1.217 | 0.084 | 0.080 | 0.112 | ..... | None. | None. | None. | |
| 6291 | .....do | A I W | 0.580 | 1.464 | 0.086 | 0.090 | 0.114 | ..... | None. | None. | None. | |
| 6292 | .....do | 78 B X | 0.562 | 1.325 | 0.300 | 0.045 | 0.060 | ..... | None. | None. | None. | |
| 6293 | .....do | 78 B R X | 0.563 | 1.330 | 0.310 | 0.047 | 0.057 | ..... | None. | None. | None. | |
| 6294 | .....do | 78 B R* | 0.592 | 1.317 | 0.320 | 0.051 | 0.055 | ..... | ..... | None. | None. | |
| 6373 | .....do | S C L | 0.590 | 1.262 | 0.275 | 0.020 | 0.030 | ..... | ..... | ..... | ..... | |
| 6374 | .....do | S L | 0.590 | 1.305 | 0.277 | 0.020 | 0.034 | ..... | ..... | ..... | ..... | |
| 6375 | .....do | S S S | 0.610 | 1.289 | 0.257 | 0.020 | 0.034 | ..... | ..... | ..... | ..... | |
| 6399 | .....do | S | 0.550 | 1.200 | 0.300 | 0.050 | 0.025 | 0.024 | 0.903 | ..... | ..... | |
| 6400 | .....do | 78 | 0.600 | 1.390 | 0.300 | 0.070 | 0.065 | ..... | ..... | ..... | ..... | |
| 6411 | .....do | S E | 0.630 | 1.262 | 0.290 | 0.048 | 0.026 | ..... | ..... | ..... | ..... | |
| 6414 | .....do | S I M | 0.594 | 1.105 | 0.290 | 0.045 | 0.030 | ..... | ..... | ..... | ..... | |
| 6417 | .....do | 81 R | 0.550 | 1.309 | 0.255 | 0.060 | 0.075 | ..... | ..... | ..... | ..... | |
| 6419 | .....do | 81 G | 0.480 | 1.280 | 0.575 | 0.058 | 0.061 | ..... | ..... | ..... | ..... | |
| | Receiver steel | | 0.220 | 0.760 | 0.005 | 0.125 | 0.052 | ..... | ..... | ..... | ..... | Model 1894. |
| | .....do | | 0.386 | 0.671 | 0.195 | 0.025 | 0.128 | ..... | ..... | ..... | ..... | Model 1896. |
| | .....do | | 0.381 | 0.663 | 0.080 | 0.082 | 0.071 | ..... | ..... | ..... | ..... | Model 1898. |
| | .....do | | 0.347 | 0.570 | 0.080 | 0.049 | 0.054 | ..... | ..... | ..... | ..... | From fractured receiver. |
| | .....do | | 0.338 | 0.579 | 0.084 | 0.051 | 0.051 | ..... | ..... | ..... | ..... | Do. |
| | .....do | 88 R F | 0.431 | 0.730 | 0.086 | 0.050 | 0.060 | ..... | ..... | ..... | ..... | |
| 6401 | .....do | R C | 0.330 | 0.620 | 0.040 | 0.024 | 0.075 | ..... | ..... | ..... | ..... | |
| 6402 | .....do | R C F | 0.275 | 0.688 | 0.040 | 0.028 | 0.080 | ..... | ..... | ..... | ..... | |
| 6415 | .....do | R C 1 | 0.310 | 0.592 | 0.038 | 0.040 | 0.075 | ..... | ..... | ..... | ..... | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Shrapnel | | 0.147 | | | | | | | | | |
| 5994 | Cast steel from bodies of 1,000-pound shell. | 5057 | 0.540 | 0.698 | 0.545 | 0.060 | 0.064 | | | | | |
| 5998 | do | 5097 | 0.500 | 0.710 | 0.541 | 0.090 | 0.067 | | | | | |
| 9533 | 3.6-inch mortar body | M B 7 | 0.562 | 0.705 | 0.250 | 0.030 | 0.025 | | | | | |
| 9534 | do | M B 11 | 0.520 | 0.690 | 0.270 | 0.029 | 0.026 | | | | | |
| | do | M B 22 | 0.504 | 0.601 | 0.263 | 0.031 | 0.027 | | | | | |
| | do | M B 32 | 0.500 | 0.550 | 0.260 | 0.030 | 0.026 | | | | | |
| 6219 | Pivot socket, 6-pounder mount | A 6<br>P S 6 | 0.260 | 0.645 | 0.263 | 0.038 | 0.037 | | | | | Cast steel. |
| 6221 | do | A 8<br>P S 6 | 0.575 | 1.300 | 0.517 | 0.031 | 0.035 | | | | | Do. |
| 6275 | do | A 19<br>P S 6 | 0.340 | 0.702 | 0.220 | 0.045 | 0.031 | | | | | Do. |
| 6359 | Pivot socket, 15-pounder mount | A 23<br>P S 15 | 0.430 | 0.877 | 0.152 | 0.065 | 0.040 | | | | | Do. |
| 6360 | do | A 24<br>P S 15 | 0.300 | 0.603 | 0.225 | 0.065 | 0.051 | | | | | Do. |
| 6362 | do | A 26<br>P S 15 | 0.492 | 0.344 | 0.237 | 0.068 | 0.040 | | | | | Do. |
| 6426 | do | A 28<br>P S 15 | 0.313 | 0.501 | 0.235 | 0.065 | 0.035 | | | | | Do. |
| 6257 | Piston rod, 6-pounder mount | A 12<br>P R 6 | 0.909 | 0.190 | 0.235 | 0.018 | 0.032 | | | | | |
| 6274 | Inner base, 15-pounder mount | A 17<br>I B 15 | 0.272 | 0.840 | 0.220 | 0.043 | 0.280 | | | | | |
| 6422 | do | A 18<br>I B 15 | 0.250 | 0.580 | 0.241 | 0.060 | 0.040 | | | | | |
| 6072 | Hoop, 3" R. F. gun | A 54<br>3 H B 1 | 0.578 | 0.820 | 0.094 | 0.047 | 0.026 | | | | | |
| 6075 | Jacket, 6-pounder R. F. gun | A 54<br>6 J M | 0.581 | 0.845 | 0.094 | 0.050 | 0.026 | | | | | |
| 6232 | Tube, 6" R. F. gun | 6 R F 18 T<br>M T 2 M | 0.500 | 0.685 | 0.320 | 0.025 | 0.040 | | | | | |
| 6233 | Jacket, 6" R. F. gun | 6 R F 17 J<br>M T 1 O | 0.530 | 0.748 | 0.300 | 0.016 | 0.039 | | | | | |

## *CHEMICAL ANALYSES OF BRONZE, BRASS, AND LUMEN METAL.*

| Marks. | Description. | Cu. | Sn. | Zn. | Pb. | Al. | Fe. | Sb. | As. | Mn. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Bronze cradle for 3" | 53.20 | 0.52 | 46.38 | ..... | ..... | ..... | ..... | ..... | ..... |
| 2 | Field carriage | 53.83 | 0.55 | 45.62 | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | | 54.00 | 0.50 | 45.50 | ..... | ..... | ..... | ..... | ..... | ..... |
| A 4 P y 6 | Bronze pivot yoke 6-pdr. mount | 99.90 | 9.10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| A 12 P y 6 | ....do | 98.69 | 9.31 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | Parsons manganese bronze | 58.89 | 0.25 | 38.06 | 0.10 | 0.74 | 1.54 | ..... | ..... | 0.42 |
| 35 | Cartridge brass | 70.02 | None. | 29.90 | ..... | ..... | ..... | ..... | ..... | ..... |
| C 2 | .....do | 69.47 | None. | 30.51 | ..... | ..... | ..... | ..... | ..... | ..... |
| C | .....do | 69.00 | None. | 31.00 | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | Lumen metal | 9.10 | 0.15 | 82.52 | 0.50 | 7.68 | ..... | None. | None. | ..... |

## Private Tests.

### *TESTS MADE FOR PRIVATE PARTIES DURING THE FISCAL YEAR ENDED JUNE 30, 1899.*

| Date. | Material. | For whom tested. | | |
|---|---|---|---|---|
| | | Name. | City. | State. |
| 1898. | | | | |
| July 7 | Leather traces | The Congdon & Carpenter Co | Providence | R. I. |
| 13 | Cast iron | E. D. Leavitt | Cambridgeport | Mass. |
| 13 | Building tile | The H. B. Camp Co | Aultman | Ohio. |
| 15 | Steel plate | Mutual Boiler Insurance Co | Boston | Mass. |
| 27 | Steel bars | Savage Arms Co | Utica | N. Y. |
| Aug. 4 | .....do | A. Perrin | Brookline | Mass. |
| 11 | Cast iron | Geo. H. Lincoln & Co | Boston | Mass. |
| | Steel bars | Savage Arms Co | Utica | N. Y. |
| 18 | Pig iron | Chas. E. Coffin | Muirkirk | Md. |
| Sept. 10 | Bricks | H. W. Ball | Boston | Mass. |
| | Leather traces | The Congdon & Carpenter Co | Providence | R. I. |
| 16 | .....do | .....do | .....do | R. I. |
| 17 | Steel bars | Savage Arms Co | Utica | N. Y. |
| | Manila hawser | Standard Rope and Twine Co | Boston | Mass. |
| | Angle irons | H. W. Ball | .....do | Mass. |
| 19 | Steel-wire rope | The Hazard Manufacturing Co | New York | N. Y. |
| 20 | Bricks | H. W. Ball | Boston | Mass. |
| 27 | Steel bar | Savage Arms Co | Utica | N. Y. |
| Oct. 8 | Turn-buckles | New England Bolt and Nut Co | Boston | Mass. |
| 14 | Steel bars | Savage Arms Co | Utica | N. Y. |
| 20 | Bronze | Fore River Engine Co | Weymouth | Mass. |
| 25 | Granite | The Ross Granite Co | Worcester | Mass. |
| Nov. 8 | Steel-wire rope | The Hazard Manufacturing Co | New York | N. Y. |
| 9 | Copper wire | New York Insulated Wire Co | Wallingford | Conn. |
| 11 | Bricks | New York, New Haven and Hartford R. R. Co. | Boston | Mass. |
| 17 | Steel bar | Percy M. Blake | Hyde Park | Mass. |
| 21 | Tackle blocks | Boston and Lockport Block Co | Boston | Mass. |
| 22 | Steel-wire rope | The Hazard Manufacturing Co | New York | N. Y. |
| Dec. 6 | Cast iron | Golding & Co | Boston | Mass. |
| 10 | Manila rope | Durand Woodman | New York | N. Y. |
| 12 | Steel bars | Savage Arms Co | Utica | N. Y. |
| 14 | Sandstone | The West Virginia Co | Philadelphia | Pa. |
| 22 | Steel plates | Pennsylvania R. R. Co | Altoona | Pa. |
| 24 | Manila rope | Standard Rope and Twine Co | Boston | Mass. |
| 27 | Cotton duck | The Manville Co | Providence | R. I. |
| 1899. | | | | |
| Jan. 11 | Steel bars | Savage Arms Co | Utica | N. Y. |
| | Cotton duck | The Manville Co | Providence | R. I. |
| 14 | Limestone | A. P. Kehr | Buffalo | N. Y. |
| 17 | Bricks | J. S. Jacobs & Son | Boston | Mass. |
| 24 | Leather belting | H. & M. Manufacturing Co | .....do | Mass. |
| Feb. 2 | Limestone | W. J. Sullivan | .....do | Mass. |
| | Anchor bolts | Boston Elevated Rwy. Co | .....do | Mass. |
| 8 | Manila rope | Standard Rope and Twine Co | .....do | Mass. |

*TESTS MADE FOR PRIVATE PARTIES, ETC.*—Continued.

| Date. | Material. | For whom tested. | | |
|---|---|---|---|---|
| | | Name. | City. | State. |
| 1899. | | | | |
| Feb. 24 | Leather traces | The Congdon & Carpenter Co | Providence | R. I. |
| 25 | Manila rope | Durand Woodman | New York | N. Y. |
| | Rubber belting | Revere Rubber Co | Boston | Mass. |
| Mar. 1 | Steel bar | Marlin Fire Arms Co | New Haven | Conn. |
| | Sprocket chain | Crompton & Knowles Loom Works | Worcester | Mass. |
| 6 | Ulster iron | Charles F. Bellows | Boston | Mass. |
| 11 | Wrought iron | Kinsley Iron and Machine Co | Canton | Mass. |
| | German-silver wire | E. D. Leavitt | Cambridgeport | Mass. |
| 13 | Manila rope | Durand Woodman | New York | N. Y. |
| | Tie plates | Boston and Maine R. R. Co | Boston | Mass. |
| 14 | Marble | Adams Marble Co | Adams | Mass. |
| 18 | Cast iron | Whittier Machine Co | Boston | Mass. |
| | Bronze | do | do | Mass. |
| 20 | Car couplers | The American Manufacturing Co | New York | N. Y. |
| | Steel bars | The Marlin Fire Arms Co | New Haven | Conn. |
| 22 | Weighing machine. | The Watson & Stillman Co | New York | N. Y. |
| 27 | Boiler plate | Social Manufacturing Co | Woonsocket | R. I. |
| | Rubber belting | Revere Rubber Co | Chelsea | Mass. |
| Apr. 3 | Limestone | R. J. Hendricks | Portland | Oreg. |
| 4 | Leather traces | Judson L. Thomson | Waltham | Mass. |
| 5 | Wrought-iron plates. | L. Nordland | Boston | Mass. |
| | Copper-coated plate. | Colley & Co | do | Mass. |
| 10 | Aluminum | H. B. Steel | do | Mass. |
| 11 | Bricks | Blandford Brick and Tile Co | Worcester | Mass. |
| 13 | Cotton yarn | Fearing Hall & Co | Boston | Mass. |
| 15 | Steel wire | The American Specialty Manufacturing Co. | Hartford | Conn. |
| | Steel-wire rope | Carson French Machine Co | Boston | Mass. |
| | Amalgamated metal. | A. W. Cabot | Stamford | Conn. |
| 21 | Steel bars | E. D. Leavitt | Cambridgeport | Mass. |
| 22 | Felting cloth | American Felt Co | Boston | Mass. |
| 25 | Copper-coated plate. | Colley & Co | do | Mass. |
| 26 | Bricks | H. W. Ball | do | Mass. |
| 29 | Copper cylinders | The Union Metallic Cartridge Co | Bridgeport | Conn. |
| May 1 | Steel bars | American Hoist and Derrick Co | St. Paul | Minn. |
| 3 | Bicycle balls | Waltham Manufacturing Co | Waltham | Mass. |
| | Cotton duck | Hall, Lincoln & Co | Boston | Mass. |
| 9 | Electrically welded steel rails. | Boston Elevated Rwy. Co | do | Mass. |
| 17 | Globe valves | The Eynon-Evans Manufacturing Co. | do | Mass. |
| 18 | Bricks | Perkins & Betton | do | Mass. |
| 20 | Ulster iron | Fuller Bros. & Co | New York | N. Y. |
| 25 | Rubber belting | Revere Rubber Co | Boston | Mass. |
| 31 | Steel bars | Schenectady Locomotive Works | Schenectady | N. Y. |
| June 1 | Belting | Wm. C. Orth | Boston | Mass. |
| 2 | Bicycle balls | Waltham Manufacturing Co | Waltham | Mass. |
| | Sandstone | J. B. Wirt | Lebanon | Oreg. |
| | Columns | John Lally | Waltham | Mass. |
| 4 | Tackle blocks | Walter Coleman & Sons | Providence | R. I. |
| 8 | Copper cylinders | Laflin & Rand Powder Co | Pompton Lakes | N. J. |
| 9 | Soft steel | American Ordnance Co | Lynn | Mass. |
| 15 | Hemlock wood | Wm. H. Ward | Lowell | Mass. |
| 16 | Pig iron | Richmond Iron Works | Richmond Furnace. | Mass. |
| | Steel bars | Savage Arms Co | Utica | N. Y. |
| | Globe valves | The Eynon-Evans Manufacturing Co. | Boston | Mass. |
| 17 | Manila rope | Durand Woodman | New York | N. Y. |
| 23 | Hemlock wood | Wm. H. Ward | Lowell | Mass. |
| 24 | Bicycle balls | Waltham Manufacturing Co | Waltham | Mass. |
| 27 | Steel bars | Savage Arms Co | Utica | N. Y. |

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